

ARCHIVES OF OTOLOGY.

SHALL THE ANTRUM BE OPENED IN ALL ACUTE EMPYEMAS OF MASTOID CELLS?

By E. F. SNYDACKER, B.A., M.D.,

INSTRUCTOR IN OTOTOLOGY, COLLEGE OF PHYSICIANS AND SURGEONS, CHICAGO, ILL.

THERE is some difference of opinion among otologists as to what method of operative procedure should be followed in acute empyema of the mastoid cells.

Broadly stated, operators in such conditions may be divided into two classes: (1) those who open the antrum mastoideum in all acute empyemas of the mastoid cells; and (2) those who open the mastoid cells without opening the antrum mastoideum; and to these two classes perhaps a third may be added, viz., those operators who occupy a position intermediate between the other two.

Perhaps the position of the second class of operators, who open the mastoid cells without going into the antrum, can best be stated by literally quoting Politzer, who stands as the exponent of this class.

Politzer (1) says: "If the middle portion of the mastoid plane ($\frac{3}{4}$ to 1 *cm* behind the osseous meatus and about 1 *cm* above the lowest point of the mastoid process) is laid free, a piece of cortex 1 *cm* wide and about $1\frac{1}{2}$ *cm* vertically is chiselled out with a large gouge set at an angle. Frequently the abscess is reached after the first blow with the chisel, from which the pus rapidly flows, a fact which shows that it is under high pressure in the cavity. In other cases one or more small abscesses are found at a depth of $\frac{1}{2}$ *cm*, and rarely at a greater depth. When the abscess is in the lower portion of the mastoid process the operation opening must be lengthened below.

"When the abscess cavity is opened, the opening in the bone is enlarged partly with the chisel, partly with Luer's forceps in the direction in which the cavity extends, and the fungoid granulations and softened bone tissue scraped away with a sharp spoon. With some experience one can easily differentiate the diseased tissue from the normal: the first gives way easily for the sharp spoon, while the normal tissue offers a certain resistance. In long-existing extensive abscess formations it is occasionally necessary to take away the greater portion of the mastoid process to the lowest point and to the sinus lateralis, the latter of which is sometimes found lying free.

"Almost without exception there was no communication between the abscess and the mastoid antrum in the large number of cases operated on by me. The establishment of an opening between the two is not wished in any case of acute middle-ear inflammation, as the wound cavity which is disinfected after scraping would become reinfected by the pus from the antrum.

"The favorable effect of opening a mastoid abscess is manifested in most cases shortly after the operation by a rapid fall of the fever, through the disappearance of local pain, and the general well feeling of the patient.

"The average duration of the wound treatment until complete cicatrization varies in the regular course from two to five weeks. Irregular course of the wound is observed in infectious middle-ear affections, occasionally with influenza, in cachectic individuals, and when the abscess cavity has not been sufficiently scraped out. Unfavorable symptoms during the treatment of the wound are frequent rise of temperature, suppuration in the wound cavity, abscess formation in its vicinity, erysipelas, headache, and vomiting, which signify a consecutive intracranial affection. A close examination of the wound cavity and the further removal of all remaining particles of carious or necrotic bone and fungoid growths are sufficient in many cases to produce a normal course of healing. Fatal results from meningitis, sinus phlebitis, and pyæmia are rare and are usually seen in tuberculous and cachectic individuals."

As the exponent of Class 1, or those who open the antrum in all cases of acute empyema of the mastoid cells, Schwartz (2) may be selected, and he employs the following well-known method: "After the incision is made and the periosteum laid back the bone is carefully inspected; if a fistula is disclosed or discoloration of the cortex, the bone is here opened with gouge or chisel and the granulations and diseased bone removed. If the cortex is healthy, that spot of bone is selected for opening into the antrum where one can enter the antrum by the shortest route and where nature herself in her spontaneous cures has indicated the path. This is at the root of the mastoid beneath the linea temporalis at the level of the superior wall of the osseous meatus and the spina supra meatum, almost always 5 to 10 mm posterior to the latter; the bone usually shows at this spot a greater number of perforating vessels. The tip of the mastoid is only attacked when the cortex in this region is diseased, or a hard infiltration or descending abscess can be felt under the tip. If the antrum is to be entered by the short route, a cone-shaped opening is made at the above-described spot, the tip of the cone being the antrum. This is carefully curetted, all pus and granulations being removed. *Free communication is made between antrum and tympanum* and maintained as long as possible, so that antiseptic solutions can pass freely from one to the other."

Intermediate between Class 1 and Class 2 comes a class of which Hessler (3) is the type. He holds that at times it is necessary to open the antrum in acute empyemas, but at other times it is not. When only the terminal pneumatic cells are involved, he holds that it is entirely unnecessary to enter the antrum. He reports twenty-three cases in which he opened mastoid cells, and removed pus and diseased tissue without opening the antrum. In some of the cases he had originally intended to open the antrum, but when he had curetted and chiselled away the diseased portion and come again on healthy bone, he had fulfilled the requirements of good surgery and therefore decided to stop. Usually a few weeks after the operation Hessler's patients were completely cured, while where he opened the antrum the

treatment lasted months and in some cases years. Of his twenty-three cases, twenty-two made rapid recoveries. One died of tuberculous meningitis. In describing these twenty-three cases, Hessler's statements in regard to time required for complete healing are so indefinite that it is impossible to estimate the average time of after-treatment.

Hessler lays down rules by which suppuration of the antrum may be differentiated from suppuration of the terminal cells. When there is retention of pus in the antrum, the pain to pressure and the swelling of soft parts begin at that spot immediately behind the auricle on a level with the superior meatus. In this region are the fistulas leading to the antrum. In empyema of the cells the findings are different: the abscess lies toward the tip of the mastoid; Hessler confirms the observation of Bezold, that the symptoms of inflammation then appear first at the tip of the mastoid and are circumscribed at this region. This finding Hessler considers almost pathognomonic of empyema of terminal mastoid cells. Abscess formation in neighboring soft parts he also considers characteristic of empyema of terminal cells. In cases of doubt the operation clears up the diagnosis.

The first to draw a sharp boundary line between opening the cells and opening the antrum was Hedinger (4), who says: "I am for absolutely separating these operations, which are not, as a rule, held sufficiently distinct by surgeons, but which surgical anatomy and the clue which nature affords in fistulas of the antrum sharply differentiate."

Bezold (5) reports a case of empyema of the tip of the mastoid where he opened the abscess without opening the antrum, and the case was completely healed in three weeks.

Urbantschitsch (6) holds that in acute empyemas, if there is a fistula leading toward, or an abscess communicating with, the antrum, if meningeal symptoms are at all prominent, if the posterior superior wall of the auditory meatus is bulged forward, then the antrum must always be opened; but when the abscess is at the tip of the mastoid, if none of these symptoms are present the opening and curetting of the abscess suffice without opening the antrum.

In answer to the position taken by Hessler, Schwartze says: "Hessler tries to differentiate, in acute mastoiditis and empyemas of the mastoid cells, between merely opening the cells and opening the antrum. The former procedure he deems sufficient where there is circumscribed empyema of the terminal cells. Without doubt such circumscribed empyemas do occur, but the diagnosis before and during the operation is a doubtful one, so that in every case one is safer to open the antrum mastoideum and to assure oneself that this, the most frequent seat of empyemas, does not contain another focus of infection, for in that case in a short time another operation must be performed. The fact that the signs of inflammation are circumscribed and appear first at the tip of the mastoid, also the appearance of infiltrations and descending abscesses at the tip of the mastoid are by no means a sure proof, as Hessler assumes, that the inflammation is confined to a few terminal cells, but it merely shows that the pyogenic organisms cause the disease to take an anomalous form, perhaps because there are congenital openings in the cortex of the bone, so that they first reach the periosteum at the tip of the mastoid and here cause inflammation. In such cases it is my custom to do as he and others do, always to search first at the tip of the mastoid for pus, but I never rest content with merely opening and removing the tip, but always open on into the antrum and make free communication with the tympanum. *The greater trouble will be rewarded by the greater security of the result.*"

Zaufal, Lucae, Jacobson, Ferrer, Schubert, Hecke, Weil, Körner, Scherer, Küster, Stacke, Riel, Müller, Trautmann, Manasse, Wintermantel, Singer, and many others always open the antrum in acute empyemas of the mastoid.

And now briefly to consider the advantages and disadvantages of the different methods. Politzer has found by experience that the after-treatment of cases operated by the Schwartze method is a much longer one than where the cells are merely opened and drained. In the former case, pus from the middle ear is constantly reinfected the freshly

curetted bone, while in the latter the wound is soon closed and healed.

Hessler in his twenty-three cases where the antrum was not opened found that the after-treatment was a matter of weeks, where it had formerly taken months and even years.

Every one who has had the after-treatment of these cases operated on for acute empyemas, where the antrum has been curetted and the aditus enlarged, knows how disagreeable and tedious both for patient and physician such after-treatment is, how the pus from the middle ear is constantly bathing the wound, and how well justified Politzer's objections to this method are.

I saw in Politzer's clinic four cases which had been operated for acute empyema of the mastoid cells without opening the antrum, all of which were healed completely within five weeks. Politzer places the time of after-treatment from two to five weeks. I have collected from Grunert and Zeroni's report all of the cases operated in Schwartz's clinic for acute empyema of the mastoid in the last two years, with the time of after-treatment.

Cases (7) operated from April 1, 1898, to March 31, 1899:

1. F. Meylink, after-treatment 2½ months, patient left clinic not healed.	11. H. Jost, after-treatment 2 m.
2. Ch. Dahne, after-treatment 2 m.	12. M. Horning " " 1 m.
3. K. Teichman " 1 m.	13. B. Düring " " 2 m.
4. O. Gobel " 6 weeks, one side not yet healed, both sides operated.	14. C. Jung " " 2½ m., not fully healed, result unknown.
5. R. Ziegenhorn, after-treatment 2 months.	15. A. Dietrich, after-treatment 2 m.
6. E. Mutter, after-treatment 1 m.	16. E. Bohlman " " 6 m.
7. M. Hessler " " 4 m.	17. A. Folner " " 2½ m.
8. G. Schneider " " 6 w.	18. Andreas " " 2 m.
9. E. Muth " " 1 m.	19. H. Ohlberg " " 6 m.
10. H. Goldschildt " " 3 m.	not healed at time of discharge.
	20. G. Martin, sinus thrombosis, death.
	21. G. Stockman, tubercular meningitis, death.

An accurate average of the time of after-treatment cannot be made, as a number of patients left the clinic before the wound was completely healed. The average time could not have been less than two and a half months and was probably about three months.

Cases (8) operated from April 1, 1899, to March 31, 1900:

1. H. Marr, after-treatment 6 w.	21. K. Rolle, sinus thrombosis, death.
2. W. Gandig " " 3 m.	22. M. Henne, died of pneumonia.
3. E. Gruss " " 5 m.,	23. A. Pech, died of meningitis.
not yet healed.	24. W. Heitmann; after-treatment 1
4. A. Wribel " " 2½ m.	m., not healed.
5. F. Liebezeit " " 2 m.	25. F. Hempel, after-treatment 2½ m.
6. H. Frommig " " 2½ m.	26. L. Reinhold " " 1½ m.
7. M. Althaus " " 6 w.	27. M. Krönert " " 2½ m.
8. A. Grimm " " 1 m.	28. H. Jelle, after-treatment 3 m.
9. Thieme " " 3 w.	29. E. Rosch " " 2 m.
10. A. Vogel " " 4 w.	30. B. Kathe " " 3 w.
11. C. Conter " " 6 w.	31. E. Boutz " " 6 w.
12. O. Reichenbach " " 2 m.,	32. F. Boulke " " 4 m.
not yet healed.	33. C. Fischer " " 1½ m.
13. F. Hohmann " " 4 w.	34. E. Schreck " " 1½ m.
14. H. Bonnkawsky, after-treatment	35. M. Mirdlich } Still under treat-
3½ m.	36. W. Fuchs } ment.
15. E. Langer " " 4 w.	37. Sheel }
16. L. Schlacht " " 4 m.	38. H. Knapp }
17. F. Bernstein " " 1 m.	39. C. Willner, after-treatment 1½ m.
18. E. Voigt " " 1 m.	40. O. Hechler " " 2 m.
19. F. Schutze " " 4 m.	41. C. Shiedlo " " 3 m.
20. Knabe " " 1 m.	42. C. Prüfer " " 2 m.

Here, too, the average duration of after-treatment is somewhat uncertain, but is about two and a half months.

If Politzer's cases heal more quickly, if the wounds are cleaner, if the operation is a much simpler one, what are the disadvantages which prevent this method from being universally employed? Schwartze has given them when he opposes the position taken by Hessler, and when he says, "In every case one is safe to open the antrum mastoideum, and to assure oneself that this, the most frequent seat of empyemas, does not contain another focus of infection"; and again, "The greater trouble will be rewarded by the greater security of the result."

Where the antrum is left undrained, the operator must be prepared at any moment to do another operation, and that when the symptoms are urgent, and the condition of the patient far less favorable than at the first one.

Politzer says: "If during the course of after-treatment, there should be rise of temperature, headache, nausea, vomiting, etc., one can always do a second operation and search for the cause of these symptoms." But how unpleasant a thing such a second operation is with such symptoms present, and how dangerous to again anæsthetize a patient in such a condition!

The question naturally arises: Is there any means by which

we can combine the advantages of the two methods and eliminate, partially at least, their disadvantages, by which we can get our cases to heal as quickly as Politzer does and still be as safe as Schwartze is? The rules which Urbantschitsch has laid down as to when the antrum must be opened in acute empyemas are sound, and an operator would be taking heavy chances to disregard them. If meningeal symptoms are prominent, if a fistula leads toward the antrum, if the posterior superior wall of the meatus is bulged forward, or when signs of inflammation are localized in this region, then in every case the antrum should be opened.

And now as to the question whether, when none of these symptoms are present, it is safe to leave the antrum unopened.

We can here disregard the question of primary suppurations of the mastoid cells, without involvement of the middle ear, for though such cases have been reported by Toynbee (9) and Zaufal (10), because of their extreme rarity they cannot enter into the consideration of this question.

There are some points in the anatomy of the parts and in the pathology of acute empyemas of the mastoid cells which have a decided bearing on the question, and these it might be as well to touch upon.

The antrum forms the connecting link between the tympanic cavity on the one hand, and the mastoid-cell system on the other. Schwartze and Eysell compare the mastoid cells to a hollow pyramid all of whose axes run toward a common centre, which is the antrum mastoideum. The antrum is a direct continuation, by means of the aditus ad antrum, of the recessus epitympanicus. The superior wall or roof of the antrum is a direct continuation of the tegmen tympani, into which it merges without any particular line of demarcation. The floor of the antrum makes a rather sharp bend, which causes it to form an angle of 90° with the tympanic wall. This is an important anatomical feature; it makes the relation of the antrum to its tympanic outlet just exactly the same as the relation of the antrum of Highmore

to the ostium maxillare. In each case the outlet is almost on a level with the roof of the cavity. For fluid to drain away through the tympanum, the cavity must fill up and overflow at the top.

The walls of the antrum are sieve-like; the openings vary in size; they may be so minute that it is difficult even to establish their existence. These openings are the communications with the mastoid cells.

In two ways the antrum may be a source of danger in acute empyemas: if the mucous membrane becomes swollen because of the peculiar anatomy of the parts, the outlets of the antrum are easily shut off, and an undrained empyema of the antrum ensues; or certain pathological changes occur in the antrum, such as polypoid degeneration of the mucous membrane, formation of granulations, necrosis of the bony walls, etc., which cause the antrum itself to become a focus and disseminator of infection.

In every operation for acute empyema of the mastoid cells, unless the operator makes it a routine practice to open the antrum, he must ask himself these two questions: Is the antrum drained? Has it undergone such pathological changes that it is a focus of infection? If he is in doubt on either of these two points, then he must open the antrum.

When we bear in mind the fact that empyemas of the mastoid cells are always secondary to middle-ear inflammation, and that the antrum always participates more or less in inflammation of the middle ear, then we can readily understand the weakness of Hessler's position when, after opening and curetting an abscess of the cells, because he again comes on normal tissue, he sees no indication for going farther and opening the antrum.

Rapidity in effecting cures does not compensate endangering the patient's life, and if either of these two conditions is present in the antrum the patient's life is certainly endangered. What can and should be avoided, however, is useless curetting of the antrum and aditus.

Over and over again I have seen operators, where there was absolutely no indication for it, curette the antrum and enlarge the aditus. What was the consequence? Pus which

should have drained through the membrana tympani, instead drained out through the antrum and the freshly cleansed bone cavity.

Every time the antrum is opened in acute empyema, the first opening into the antrum should merely be exploratory, and as small as is consistent with exploration of that cavity. If there is no empyema of the antrum, no granulations, no polypoid growths, no pathological changes which indicate it, then widely to open the antrum, enlarge the cavity, make broad communication with the tympanum, so that the pus is constantly reinfecting the wound, seems an absurdity.

If when the antrum is carefully opened no pus wells up, and it will usually well up as if under pressure where there is a closed empyema, and if on careful examination with probe and by inspection no pathological changes are found, then the relations of the parts should be disturbed as little as possible. In this way we can to a certain extent at least combine the advantages of the Politzer method with those of the Schwartze.

Without some exploration, at least, it is impossible to say with absolute certainty what the condition of the antrum is, and of this condition every conservative operator, bearing in mind that the antrum is always more or less involved in purulent middle-ear disease, must convince himself, but the first opening should be merely exploratory, and if he has convinced himself that the antrum is not the seat of danger, then he should at once desist from further disturbing the parts.

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CONTRIBUTIONS TO THE NORMAL AND PATHOLOGICAL HISTOLOGY OF THE PHARYNGEAL TONSIL.

By FRIEDRICH WEX, ROSTOCK.

IT will probably not be devoid of interest to mention a few historical data concerning the pharyngeal tonsil whose anatomy and pathology have of late received such unusual attention. The study of its normal structure has been awakened by the discovery of the importance of its diseases.

In 1665, C. Schneider was the first to describe and illustrate its anatomy in his book, *De Catarrhis*. Winslow followed in 1732 and Santorini in 1775. The latter was the first to compare it to a tonsil. In 1846, Tortual called attention to the ridges and furrows in the lining coat of the vault of the pharynx, and Lacanher recognized first its glandular nature in 1753. Kölliker confirmed this observation in 1863 and gave 9 *mm* as the thickness of the glandular layer and declared its structure to be identical with that of the faucial tonsil.

Since the thorough works of Luschka, Wendt, and Meyer, aural surgeons have given this subject adequate attention, whereas in their publications anatomists have failed to present the topography and minute structure of this organ with sufficient detail and accuracy.

The pharyngeal tonsil is an organ normally found in every human being. It is of foetal origin and occupies the roof of the pharyngeal cavity from the choanæ to the anterior border of the body of the occipital bone, and extends from one fossa of Rosenmueller to the other. This gland is subject

to very considerable macroscopic variations and consists of a mucous membrane $\frac{3}{4}$ cm in thickness, divided by vertical furrows whose number, depth, and course vary considerably. A deep median and two shallow lateral furrows divide the gland into six ridges which run parallel, and slightly converging at their posterior ends. The furrows are interrupted by transverse bridges. The ridges are yellowish-red and nearly always covered with thick mucus. Its removal uncovers, at the crest of the ridges, the punctate elevations of the mouths of the follicles and gives the surface a granular appearance. The knowledge of the histology of the pharyngeal tonsil in the new-born or the young infant is essential for the proper recognition of the normal structure (for without it it would be impossible to judge of its diseased state). The exposure to all kinds of inflammatory and catarrhal conditions, after the first months of life, usually leaves this gland not entirely normal even if no macroscopical alterations are observable.

In common with other authors that have examined the gland of the new-born, the authors distinguish three divisions in the cross-section of a well-developed ridge: 1st. Epithelium with basement membrane; 2d. Propria; 3d. Submucosa.

1. The epithelium is of the ciliated columnar type, 0.11 mm in thickness, and consists of a fine layer of columnar cells ciliated above and conical below, slightly granular, with an intensely stained nucleus in its lower third. This layer is supported by a stratum of six rows of cubic and ovoid cells, of which the uppermost row sends out long, spindle-like processes between the lower portions of the columnar cells. The cubic cells contain quite a large nucleus surrounded by a moderate amount of protoplasm. A continuous row of cubic cells with well-stained nuclei form and define the basis of the epithelial covering. These three epithelial layers rest upon a fine even band without definite structure, known as the basement membrane.

2. The propria or the true adenoid tissue has 10-20 times the thickness of the epithelium, to which it runs parallel. The frame of this layer is a network of very fine connective-

tissue fibres which support faintly stained spindle cells at their intersections. These structures are observed only in pencilled specimens. The reticulum contains, especially in children, numerous blood-vessels, lymphatics, and capillaries, whose walls help in making up the structure of the reticulum. Small cells with well-stained nuclei and little protoplasm fill and completely hide the supporting structure. The irregularly distributed round cells occur in greatest numbers around the blood-vessels and may give indication of follicle formation.

3. The submucosa consists of a wide stratum of scantily nucleated fibrous tissue which runs in undulating bands parallel to the surface and contains the blood-vessels and lymphatics. These are frequently filled with leucocytes and surrounded with cellular infiltration. The bulk of mucous glands are located at the base of this layer. Their bodies are made up of ramified and convoluted tubes lined with nucleated columnar epithelium. The juxtaposition of two ridges creates a slit-like depression for the reception of glandular secretion.

The basilar fibro-cartilage subjoins this layer. It forms no part of the gland. The author has also investigated the finer anatomy of the lymphatic cells of the pharyngeal tonsil. The round cells of this organ in the new-born and young infant are pure lymphocytes with molecular contents. No acidophile or mast-cells or hyalin globules were observed. (Examined with Ehrlich's triacid solution.)

All but one specimen were lined with ciliated columnar epithelium. Slightly horny epithelium covered the tonsillar surface in a single instance of a five-day-old child, without extension into the lacunæ or into the mouths of the ducts. The merging of columnar into squamous epithelium could be plainly seen. The author has also investigated the extent of the elastic tissue in the pharyngeal tonsil with the Orcein method of Unna-Taenzer. The submucosa supports a network of firm elastic fibres which run in a longitudinal direction and surround densely the glandular substance and blood-vessels. Fine elastic fibres run parallel to the surface near the edge of the propria, whence fibres proceed into the

lymphoid tissue almost at right angles. Fine elastic fibres run lengthwise directly under the epithelium and extend up and into the basement membrane.

All authors regard the epithelial cell infiltration in later life as a normal process, and ascribe any abnormalities to changes in the glands and blood-vessels. If no pathological conditions supervene, the elevations become more prominent and the glands and blood-vessels diminish.

For the minutiae of the microscopic appearances of post-nasal hyperplasia and tuberculosis the reader is referred to the original.

The author's cases of tuberculosis of the pharyngeal tonsil are sufficiently important to justify their publication.

CASE 1.—The columnar epithelium is well preserved even in the crypts, and is fringed with ciliae of unusual length. The fibrous tissue and blood-vessels are moderately developed and the vascular walls are not thickened. The follicular outlines and germinal centres are easily recognizable. Macroscopic inspection of the specimen shows the centre insufficiently stained with the acid solution of brown hæmatine. Ten or twelve tubercle nodules, which occupy the adenoid tissue of the lobule, become confluent in deeper sections, show central cheesy degeneration, many typical giant-cells of Langhans, and a few tubercle bacilli.

CASE 2.—Patient three and a half years old. Ciliated columnar and squamous epithelium line the cross-section of the post-nasal tonsil, which is well supplied with fibrous tissue and blood-vessels. Hemorrhage into the central portion of the tonsil separates the adenoid tissue into irregular surfaces, which present tubercle nodules with multinuclear giant-cells and cheesy degeneration. In the vertical sections of the specimen the same formations are present and extend to the epithelium, which is everywhere intact. One unmistakable tubercle bacillus is found.

CASE 3.—The larger part of the cross-section of the specimen is covered with ciliated columnar epithelium; the remainder with the squamous variety, and its substance has a subnormal fibrous and vascular supply. Small tubercle nodules are irregularly distributed through the section from the basis to the epithelium. A small number of tubercle bacilli are present.

CASE 4.—Two parts of this tonsil, which was removed piecemeal, contained confluent miliary tubercles, tubercle bacilli, and giant-cells without cheesy degeneration.

CASE 5.—A section of a large tonsil from a five-year-old patient shows ciliated columnar epithelial covering, the fibrous tissue well developed, hypertrophy and hyaline degeneration of vascular walls, and distinct follicles. The well-marked tubercular deposit at the base of the tonsil contains typical large giant-cells. Similar tubercular formations in the vertical sections of the tonsil show tubercle bacilli, but no cheesy degeneration.

CASE 6.—Stratified squamous epithelium covers almost entirely this section, which has a poor fibrous and vascular supply. Confluent and degenerated tubercles of varying size are disseminated through the adenoid tissue and epithelium, which they partly destroy. Giant-cells and tubercle bacilli are scantily present.

CASE 7.—Processes of stratified squamous epithelium which covers the surface of this tonsil extend into the adenoid tissue. A circumscribed focus of firm hyaline connective tissue with a few round and spindle cells adjoins the basement membrane, similar in appearance to the hyaline degeneration of tubercular glands. A second focus is separated from this by a strip of adenoid tissue, which resembles closely an epithelioid tubercle. Their tubercular nature is not without doubt. The former cannot be regarded as a hyaline tubercle unless associated with other symptoms of tuberculosis, and the latter may be taken for a foreign-body tubercle due to epithelial degeneration.

In doubtful instances of this kind the presence of tubercle bacilli decides their nature; they are, however, not present. The author regards these formations as tuberculous because epithelial degeneration is not evident, the epithelioid tubercle contains leucocytes with rolled-up nuclei, and hyaline nodules are present, which are usually found in tubercular lymphatic tissue, but rarely in association with foreign-body tubercles.

Reviewing his own cases, the author describes his method of research for tubercle bacilli. He found the latter in six cases out of seven. Lermoyez and Brindel only found them once, Gottstein and Brieger found none, and Pluder found them in each one of his cases. He records the results of the following observers:

	in 100 cases	o cases of tuberculosis			
Broca					
Gottstein	" 33 "	4	"	"	"
Lermoyez	" 32 "	2	"	"	"
Brindel	" 64 "	8	"	"	"
Pluder	" 32 "	5	"	"	"
Luzzatti	" 50 "	2	"	"	"
Brieger	" 78 "	5	"	"	"
<hr/>					
Total in	389 cases	26	cases of tuberculosis,	6.7 %	
In his	210 "	7	" " "	3.3 %	
<hr/>					
In all	599 cases	33	cases of tuberculosis =	5.51 %	

The author accounts for the small percentage of pharyngeal tuberculosis in his series of examinations principally by the fact of the greater exemption from tuberculosis by the inhabitants of that part of the country. A reference to 21 authors concludes this valuable contribution.

AURAL COMPLICATIONS OF SCARLET FEVER.
WITH 12 POST-MORTEM OBSERVATIONS.

By BERNHARD VON GAESSLER, MUNICH.

Abridged Translation by Dr. O. JOACHIM, New Orleans, La.

AURAL complications of scarlet fever were not recognized by the medical profession until the second half of the eighteenth century. Between the years of 1775-78 Bang, Eichel, de Mezza, Aaskow, and Read first observed a copious fœtid aural discharge, to which the profession in subsequent years attached varying degrees of importance according to the prevailing frequency and intensity of the complication. Struve (1) describes an epidemic of scarlet fever lasting from 1799-1802, notable for the frequency of severe ear affections. Berndt (2) observed in 1825 and 1826 next in frequency to dropsy the occurrence of a fœtid otorrhœa one or two weeks after convalescence. Dr. Weisse (3) mentions in an article, published in 1856, an epidemic of scarlet fever and measles in an educational institute in Petersburg, during the prevalence of cholera, in which he was keenly impressed by the prevalence of aural discharges and abscesses of the lymphatic glands and the absence of cerebral complications and anasarca. According to Baader's (4) observation of two epidemics, the frequency of this ear complication averaged 23 %. A recent extensive statistic of Weil (5) gave an average of 10 % of otitis in scarlet fever. The great importance of this disease and its consequences to the ear impelled otologists to study it carefully, and they were the first to point out the damage to the function of the organ and even to life.

Oscar Wolf (6) found in twenty-eight cases of exfoliative otorrhœa 64 % due to scarlet fever. In forty-six cases of mastoiditis operated upon by Walter Sherrer (7), three were due to scarlet fever. The etiological rôle played by scarlet fever in the causation of ear disease ranges according to different authors from 5 % (Zaufal) (8), to 7.14 % (Knapp) (9), to 10 % (Tschärner) (10), who, however, includes diseases of the external auditory meatus.

In deaf-mutism this disease is of still greater etiological importance. Careful statistics compiled in the kingdom of Saxony show 42.6 %, in Norway 13.8 %, of deaf-mutes due to scarlet fever. Bezold (11) found in 640 patients 984 diseased ears due to scarlet fever; 37 organs had acute and 667 chronic otorrhœa. In 25.2 % the drum membrane was totally destroyed; in 48.5 % whispering voice was audible only $\frac{1}{2}$ meter; in 13 % deaf-mutism or inability to perceive whispering existed.

The relation of ear complications to scarlet fever has found varied interpretations. Hufeland, who wrote in 1839, regarded them as metastatic. Jarsley (12) held the diseased mucous membrane responsible in the majority of cases. Kraemer (13) in 1849 denied the causation of ear disease by the diseased naso-pharynx in scarlet fever. Wilde (14) regarded the ear disease in exanthemata as a consequence of naso-pharyngeal disease and pointed to the Eustachian tube as the connecting link.

Heydloff (15) expressed a similar opinion, and stated in addition that the damage to the ear due to scarlet fever or diphtheria could not be distinguished. Of the same opinion was Burkhardt-Merian (12). Demme (16), Henoch, and Heubner (17) pleaded for a discrimination between these conditions. Wolff (18) also made a distinction between them, and held the scarlet-fever diphtheria, including otitis diphtheritica, as an evidence of the intensity of the systemic infection. Moos (19) found an etiological difference between genuine diphtheria and mild cases of scarlet-fever diphtheria. The consequences to the ear, in his opinion, were identical, as in either case a mixed infection prevailed. Hartmann (20), Kessel (21), and Schweighofer (23) have

proven the existence of genuine diphtheria of the ear due to the Klebs-Loeffler bacillus. Moos separated from the mild cases the necrotic scarlet-fever angina, which propagates itself to the ear by invading the blood-vessels with masses of streptococci and thereby produces a panotitis. He held that the infection might travel through the Eustachian tube or through the lymph channels alongside of the tube. Gottstein (22) laid stress upon the systemic infection, and expressed the opinion that in the exanthemata the ear is a place of predilection for the deposit of their toxins. Voss (24) pointed out the correlation of otitis and nephritis, and thought that their onset and course should prevent us from attributing all cases to diphtheria. Haug (25) said: "In the beginning we deal with a pure nosogenous ear affection, upon which a mixed infection may easily engraft itself." He distinguished between the rather rare but severe form which occurs at the height of disease, and the more frequent, milder post-exanthematic form which occurs during desquamation. Weil (5) was of opinion that a mild middle-ear disease existed in all cases of severe scarlet fever, which he recognized by slight alterations on the drum membrane, and which he attributed to systemic infection. He admitted the aggravating influence of secondary infection.

The present writer examined the ears of 54 children during scarlet fever of mild type and found the drum membrane affected in 83.2 %. In 20.37 % hyperæmic conditions were present. In 14 out of 16 cases a functional examination showed normal hearing. In 9 of these the drum membrane showed an abnormal condition. In 2 cases of unilateral defective hearing (3 and 4 *m*) the drum was in one case depressed; in the other it showed a posterior stripe of opacity. In 65 cases, 7.69 % of otorrhœa (5 cases) existed, twice bilateral, in 3 cases unilateral. Scarlet-fever diphtheria was present in 2 cases. The author presents a record of autopsies and examinations of the petrous bones of 12 fatal cases of scarlet fever.

CASE 1.—Child two years old; death on second day after appearance of eruption. In retromaxillary fossa, enlarged lymphatics. Large lobulated adenoids in the naso-pharynx extend to

the ostium tubæ, which is free. Physiological dehiscence the size of a pea persists. Slight injection of the long process of the malleus and of the periphery of the drum membrane in posterior superior segment. Cavities of middle ear empty and lining membrane not swollen. Slight recent vascular injection at different points.

CASE 2.—Nine and a half years old. When admitted, eyes, ears, and nose normal, soft palate and uvula intensely red, tonsils enlarged. Swollen submaxillary glands. Culture examinations show staphylococci pyog. alb., aur.; streptococci, and scattered diphtheria bacilli; death on third day after appearance of eruption. Inspection of the *Mt* shows a striated reflex. The slightly hypertrophied adenoids and the openings of the Eustachian tubes are pale. Middle-ear cavity empty. A minute hemorrhagic spot under the tegmen. Moderate injection and thickening of the mucous membrane of the floor of the middle ear, over the bony portion of the tube and on the periphery of the inside of the drum. A normal dehiscence not noticed.

CASE 3.—Five and a half years old. Tonsils covered with dirty-white membrane, muco-purulent nasal secretion. Death four days after appearance of eruption. Enlarged retromaxillary glands. Pharyngeal tonsil enlarged. Normal dehiscence present in anterior lower wall of meatus, which is full of tenacious, muco-purulent secretion. Epidermis of the *Mt* shows a bleb-like elevation. Middle ear, aditus, and antrum are filled with straw-colored, tenacious secretion. The lining membrane appears grayish red and thickened, especially around the ossicles and in the antrum, where two small granulations can be seen. The drum membrane is perforated in upper posterior segment but does not appear thickened.

CASE 4.—Four and a half years old. Pharynx red, tonsils covered with dirty-gray membrane. Had measles four weeks previously. Death four days after appearance of scarlet-fever eruption. Chronic cheesy tuberculosis of peribronchial lymphatics. Beginning glomerulitis of both kidneys. In nose and nasopharynx no notable alterations. In anterior wall of bony meatus a dehiscence. Drum membrane of yellow appearance in upper posterior segment, with its lower edge concave and sharply defined. Recent vascular injection of the inner surface of cavity of middle ear, antrum, and bony portion of tube. Thin, fluid pus in

the recesses of the round and oval windows, a small amount of purulent secretion in the cavity of the middle ear.

CASE 5.—Seven months old. Scarlet fever following measles. Except the absence of reflexes the condition of the ears and throat normal when admitted. Death six days after appearance of eruption. Scarlatinous septic diphtheria of nose, pharynx, larynx, and trachea, confluent lobar pneumonia, fibrinous pleuritis. Recent inflammation of the pharyngeal tonsil and lips of the Eustachian tubes, which are covered with diphtheritic deposit. Parotid gland purulently degenerated. Dehiscence in anterior wall of meatus persists. Drum membrane grayish white, dull, covered with a thickened epidermis. The removal of the tegmen tympani discloses thick creamy pus under pressure. The entire lining membrane of the middle ear and adnexa and of the ossicles is greatly thickened and diffusely injected. Granulations on the lower half of the drum membrane, which is still transparent. Hemorrhagic points on the floor of the aditus.

CASE 6.—Patient four years old. Status on admission: Fœtid smell of breath; lips, tonsils, tongue, and fauces covered with dry gray deposit. Tonsils much enlarged. Coryza. Nephritis. Death seven days after appearance of eruption. The hypertrophied lobulated pharyngeal tonsil and the mouth of the tube are covered with membranous exudates. Pus in atlanto-occipital joint. No dehiscence in bony anterior wall of meatus. Membrana tympani of diffuse grayish-red color; the lower half covered with firm exudate. No perforation. A similar exudate fills the cavity of the middle ear and envelops and adheres closely to the ossicles and antrum wall and extends quite into the tubal opening. The mucous membrane is moderately injected and not greatly thickened. The cartilaginous portion of the tube is free from exudate, but its lining membrane hemorrhagic, swollen, and uneven. The cell membrane is succulent, thickened, pale red, and filled with purulent secretion.

CASE 7.—Patient three and one half years old. Death on seventh day after eruption. No alteration in pharynx or nasopharynx. External auditory meatus completely filled with macerated epidermis. Physiological dehiscence present. Vascular injection of long process of malleus and posterior half of drum, which seems otherwise intact. From a hemorrhagic point near the umbo, creamy pus escapes during cleansing of the macerated

membrane. The superficial cells under the tegmen, the cavity of the middle ear, the antrum, and the inner opening of the Eustachian tube filled with thick pus. The mucous membrane is everywhere thickened, and over the promontorium injected.

CASE 8.—Patient two years old. When admitted, had indistinct exudate on both tonsils. Death a week after appearance of eruption. Croup of larynx and trachea. Normal dehiscence present. Color of external surface of drum membrane normal, with slight vascular injection of handle of malleus and along the upper posterior wall of the meatus. In the cavity of the middle ear, partly muco-purulent and partly sero-purulent accumulation. The mucous membrane is slightly swollen and of grayish-red color on the floor of the middle ear, on the bony portion of the tube, and in the posterior part of the antrum and adjacent cell. On the hypertrophic pharyngeal tonsil punctiform red spots.

CASE 9.—Patient nine months old. Admitted on account of ranula and acquired scarlet fever. Right drum shows diffuse redness, left shows dulness and absence of light reflex. On the third day the redness of right drum has disappeared. Death a week after appearance of eruption. Pharyngeal tonsil and ostium tubæ somewhat thickened and injected. The anterior wall of meatus still undeveloped. The drum membrane dull and covered with thickened epidermis. Transparent redness of anterior-lower segment. The middle-ear cavity, aditus, and antrum full of creamy pus. Dark granulations are seen on the intensely red and succulently swollen mucous membrane. This condition of the mucous membrane is less pronounced on the inner wall and subsides about the head and anterior limb of the stapes. The mucous membrane lining the inner surface of the drum shows a few enlarged capillaries and, when illuminated, a number of punctiform reddish elevations. The moderate swelling of the mucous membrane over the bony portion of the tube is not present in the cartilaginous portion.

CASE 10.—Patient four and one half years old. Death thirteen days after appearance of eruption. Pharynx and mouth of Eustachian tube free. Indication of normal dehiscence. Drum membrane normal; under the tegmen normal cells. In middle-ear cavity and in antrum a very small quantity of thin, fluid, muco-purulent secretion. The lining membrane seems thickened and injected over the promontory and stapes. The membrane

in the cells adjacent to the antrum is slightly infiltrated and red.

CASE 11.—Patient eleven and one half years old. Death fifteen days after appearance of eruption. The enlarged post-nasal tonsil and the pharyngeal mouth of tube intensely red and irregularly injected. Physiological dehiscence is closed. Drum membrane and light reflex normal. The cavities of the middle-ear empty and their lining membrane nowhere swollen. Faint vascular injection over promontorium and bony portion of tube, where some muco-purulent secretion is located.

CASE 12.—Patient seven years old. On admission has copious nasal secretion and bleeds easily from nose. Death forty to forty-five days after appearance of eruption. Normal dehiscence closed. Drum membrane normal except for an injection along the posterior edge of the malleus. The cells under the tegmen are full of clear mucus. In the middle-ear cavity the secretion is somewhat more viscid and of yellowish color. A few enlarged capillaries run over the intensely swollen mucous membrane. This condition is aggravated in the mucous membrane of the antrum and cells.

Death resulted in most of the cases from complications of the lungs and kidneys. Diphtheritic membranes were present in 2 cases, lacunar tonsillitis in 1 case in which streptococci and diphtheria bacilli were found. The investigation of the dehiscence in the anterior osseous wall of meatus showed that complete closure occurred between the ages of three and five years. The conditions noted in the external auditory meatus were of no special significance. The drum membrane showed important alterations in 3 cases. In 1 an exudate existed upon the lower half, in 2 others perforations. In the 7 cases, various abnormalities were present, but they were neither uniform nor peculiar. In 2 cases a normal condition prevailed. The middle ear, the adjoining cavities, and the tympanic Eustachian opening were involved in every instance in different degrees and ways. The simple cases showed limited injection and swelling of the membrane, some secretion in the bony portion of the tube, with otherwise empty cavities. In other cases, sero-mucous and muco-purulent secretion existed in the cells

under the tegmen and in the cavity of the middle ear, with considerable swelling and injection of the mucous lining of the middle ear, aditus, and antrum. In the severe cases, thick and purulent secretion filled all the cavities, which were lined with thickened, injected, granulating, and hemorrhagic mucous membrane. These conditions were, in some instances, more pronounced on the promontorium, in others on the antrum or in the tympanic ostium of the tube or on the intact or perforated drum. They were coexisting with a mucoïd secretion as well as with a perforation of the drum, and in one case the middle ear and bony portion of the tube seemed filled with a semi-solid exudate. The cartilaginous portion of the tube showed, in this case, injection, swelling, and hemorrhagic spots. In all other cases this portion of the tube seemed normal. The deposit of membrane about the pharyngeal opening of the tube always ceased abruptly just within the mouth of the tube.

The behavior of the scarlatinous diphtheritic deposit showed great variation. In some cases the pharyngeal tonsil, the lips of the tube, the nose, mouth, larynx, and trachea were involved; in others the deposit was limited to the pharynx and larynx. Simple swelling of adenoid tissue and injection were noted in some, and in other cases inflammatory evidences were seen in the pharynx or about the mouth of the tube in all degrees of intensity. The lymphatic glands of the retromaxillary fossa were invariably enlarged and on section showed fatty infiltration.

The author arrives at the conclusion that his observations tend to show a relation of the middle-ear disease to the exanthem. Simple hyperæmia, secretory process, fibrinous exudate, form the progressive states of the ear disease due to infection. In the only case where no material alteration was found, the length of time since the initial infection may have permitted the subsidence of the ear symptoms while the nephritic condition supervened with fatal result. The fibrinous deposit in the middle ear, in the pharynx, and on the tubes, and the purulency of the atlanto-occipital joint present the most intense state of infection. In this single instance in which, the cartilaginous portion of the tube

showed evidences of recent inflammatory alterations, the opinion of Moos, that the infection can spread along the tubal mucous membrane, seems tenable. The normal condition of the cartilaginous tube in all other cases lends strong probability to the view that the ear disease is a manifestation of the general infection and not an extension of the infectious process in continuo. While the relative small number of examinations only permits the expression of a probably invariable participation of the ear in scarlet fever, they show that pronounced inflammatory processes can exist behind a normal or nearly normal drum membrane. In scarlet fever, the condition seems analogous to measles and diphtheria, in which an invariable participation of the ear has been proven. The experience gathered in variola, meningitis, recurrent fever, typhoid, and typhus proves that ear complications take first rank in the infectious diseases. Fruitnight (26) found in five thousand cases of exanthematous diseases, especially measles and scarlet fever, otitis media as the most frequent complication.

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AN ANALYSIS OF RINNE'S EXPERIMENT.

BY PROF. BEZOLD OF MUNICH.

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OTOLOGICAL SOCIETY AT HEIDELBERG, 1900.

Translated and Abridged by H. A. ALDERTON, M.D., of Brooklyn.

IN my report upon the ear patients treated from 1881 to 1883, inclusive,¹ I have, for the first time, in all cases of hardness of hearing of long duration, whose tympanic membranes offered no certain evidence for the localization of the disease, made the result of Rinne's experiment the standard for the differential diagnosis between diseases of the middle ear, the internal ear, and the mixed forms of both diseases.

The principle governing my use of Rinne's experiment has been accurately defined in my article, "Statistische Ergebnisse ueber die diagnostische Verwerthbarkeit des Rinne'schen Versuches,"² and in later works.

In the twenty years during which I have, in all appropriate cases, used this experiment, I have been able to convince myself sufficiently of its reliability and ease of application.

Notwithstanding the newer functional methods of examination (the introduction of the continuous tone series, Weber's and Schwabach's tests, upper and lower tone limits, tone gaps) I still, as heretofore, consider Rinne's experiment our most important and, in certain cases, our only decisive test as to the locality of the diseases present, where the objective examination of the ear fails to give us other evidences.

¹ *Archiv f. Ohrenhkl.*, Bd. xxi., S. 248.

² *Zeit. f. Ohrenhkl.*, Bd. xvii., 1887.

Each of the other above-mentioned tests may fail to give us in certain cases a positive result.

The absence of a large part of the lower end of the tone scale by air-conduction is, indeed, a never-failing occurrence in chronic diseases of the sound-conducting apparatus. But, according to my experience, this may also occur with diseases situated in the cochlea or in the acoustic nerve. To be sure, in such a case the bone-conduction (cranio-tympanic) will also to a like extent be lost, while in middle-ear affections it is regularly found increased. But here, because of the strong mechanical vibration produced by the application of the lower-toned forks to the head, the distinction between feeling and hearing is difficult, and in certain cases the results are open to doubt. For this reason, we must generally, in deaf-mutes, dispense with the test by bone-conduction.

Defects in the upper end of the hearing field, extending over a great part of that covered by the Galton whistle, certainly permits no doubt as to the existence of a disease in the nervous apparatus. But extensive defects here, even gaps, may occur in an otherwise well-marked picture of so-called sclerosis.

There can exist no doubt as to the untrustworthiness of Weber's experiment; best demonstrated by the manifold illusions as to the persistence of hearing after loss of the cochlea.

We can still give a relatively certain confidence to the testing of the duration by bone-conduction. If the tuning-fork is employed in such a way that it is first held to the vertex until the vibrations have ceased, as distinguished from the inverse method, in which the cranio-tympanic conduction of the patient surpasses that of the examiner, then the experiment is independent of the strength of the stroke given to the tuning-fork, and it determines only the threshold value of the patient and of the examiner. But threshold value is accounted both in physiology and in psychology among the unreliable methods. Defects still exist in this experiment, as is shown in its use.

Where, of course, the duration of bone-conduction on the

vertex of the patient is very much diminished or quite abolished, or where, on the other hand, it is found to be considerably increased, for example, fifteen seconds or more, then we need have no fear as to the diagnostic application of the results. But in the case of only relatively lessened positive or negative differences in time, then we are, especially with the deep tuning-forks (which are generally used for Schwabach's experiment), very dependent upon the acuteness of observation and attentiveness of the person examined, and further, also, upon the manifold peculiar noises of our environment. For instance, since the installation of an electrical street railway near our examining room this experiment has lost in reliability.

Anomalies in the roof of the skull, traumatic changes with depression, growing together of the bone and dura, etc., according to many observations made in our clinic on patients of the psychiatric division, seem to be not without influence and to complicate the results of Schwabach's test. Dr. Wanner will later present preliminary communications concerning this point, which first drew my attention to a striking shortening of bone-conduction, with otherwise normal hearing, induced by such anomalies of the skull.

The Rinne experiment, with the *a*¹ tuning-fork used by us¹ applied to the mastoid portion, not to the vertex, is relatively free from the defects here cited.

The patients can much easier and more sharply differentiate the rather high note of this fork from the outside noises, than that of the deep, large *A* or the small *c* fork. The short distance from the cochlea, when the tuning-fork is applied to the mastoid portion, lessens or quite excludes the disturbing influence of anomalies of the skull.

But the resulting figures, given by Rinne's experiment, are therefore more definitely and in consequence of this more easily measurable than those of Schwabach's experiment, because it involves much more widely separated extremes than the latter.

Rinne's experiment measures the time during which a tuning-fork is still heard by air-conduction after having

¹ Described in *Zeit. f. Ohrenhkl.*, Bd. xvii., 1887.

ceased to be heard on the mastoid portion following a suitably strong stroke, or, where (in diseases of the sound-conducting apparatus) the bone-conduction lasts longer, inversely the time that the bone-conduction exceeds the air-conduction. If in a given case we denote by τ the total time during which, after the strongest stroke, the tuning-fork is heard by air-conduction, and by θ the total time during which, after a similar stroke, it is heard on applying its handle to the mastoid portion, then Rinne's experiment measures the difference between these two times thus, $\tau - \theta$.

In this difference occurs now not only, as in Schwabach's experiment, the lengthening or, on the other hand, the shortening of the bone-conduction up to extinction, but besides and simultaneously also the abbreviation of the hearing time by air-conduction for the measured tuning-fork.

The following different possibilities follow from the result of Rinne's experiment :

In completely normal hearing, air-conduction always preponderates, in the case of the tuning-fork used by us (a') 30 seconds on the average. The difference $\tau - \theta$ equals therefore in the normal ear $+ 30$ (seconds).

With increasing lengthening of the bone-conduction and simultaneous shortening of the air-conduction, this positive figure approaches very quickly to the value ± 0 . If the bone-conduction is still further lengthened with simultaneous progressive shortening of the air-conduction, then the latter is exceeded by the former, and the expression $\tau - \theta$ changes to a negative figure, which, with the tuning-fork a' employed, can reach 15 (seconds) or more. Finally if the air-conduction is shortened up to 0, with the bone-conduction still persisting, only the bone-conduction remains; in this case, the difference $\tau - \theta$ (τ here = 0) takes the value of $-\theta$.

But if the air-conduction and the bone-conduction are simultaneously and equally shortened (as we may assume *a priori* in diseases beyond the conducting apparatus), then the difference $\tau - \theta$ remains nearest to that in the normal, namely $+ 30$, although the bone-conduction (measured by means of Schwabach's test) is constantly further

shortened with increasing hardness of hearing. If such a hardness of hearing advances still farther, then the air- and bone-conduction both decline according to the rule until finally the bone-conduction is abolished, *i. e.*, $\theta = 0$. In this case, only τ remains of our expression $\tau - \theta$, and we denote this result of Rinne's experiment by $+\tau$.

This method of denotation, introduced by myself, I wish once more to recall to your recollection and somewhat further to enlarge upon.

If the end of the handle of the tuning-fork is set firmly on a stand, the tuning-fork ceases to ring much more quickly than if the end of the handle is free in the air.

If the tuning-fork a^1 , used in Rinne's experiment by myself and my pupils, after the strongest stroke, is held with the ends of the prongs directly before a normal ear, it is audible for 80 to 90 seconds; whilst after an equally strong stroke, with the handle applied to a table-top it becomes inaudible (the prong ends likewise being approached as near as possible to a normal ear) in about 25 seconds; and if set upon a rubber pad, in about 10 seconds.¹

By hindering the motion of the end of the handle we can also hinder the vibrations of the struck prong ends, and the stronger the end of the handle is pressed, just so much quicker do the tuning-fork prongs lose their vibratory ability.

It is self-evident that in the judgment of numbers obtained by the testing of bone-conduction (Schwabach's test), we must take into consideration this strong obstacle to vibration which the tuning-fork experiences when its handle is fixed on a more or less firm pedestal. Yet much more is this the case for the numbers obtained by testing the difference between bone- and air-conduction—*i. e.*, Rinne's experiment.

From the beginning I have laid stress on the fact that, in using the test in the way we are generally accustomed to do,

¹ The duration is very dependent upon the character of the rubber pad. A harder, less flexible rubber pad reduces the duration much sooner than one as thick but softer and more flexible. In quite an analogous way, we must also accept that the consistency as well as the thickness of the soft parts covering the skull are able to influence the duration of bone-conduction.

we must not simply compare air-conduction and bone-conduction, but take into account the damping of the bone-conduction experienced by the tuning-fork through the application of its handle to the head.

If, after the strongest stroke, the a^1 tuning-fork is applied to the vertex of a person, and we bring our ear as near as possible to the prong ends, we find that it rings only about 18 seconds¹; in other words, only one quarter as long as when the tuning-fork rings out, with the end of the handle free and unhindered before our ear.

For example, if we obtain, in a pathological case, for Rinne's experiment the resulting number—10—*i. e.*, if the a^1 tuning-fork, after having ceased to be heard while held freely before the ear canal, is still heard ten seconds more on applying the end of its handle to the mastoid, then is the Rinne experiment, as opposed to its result in the normal ear (+ 30 seconds), not only 30 + 10 seconds shortened, but the latter number has at least a fourfold value, and the pathological variation of the Rinne experiment in the examined ear from that in the healthy ear does not amount to 40, but really to 70 or more seconds, expressed in time of air-conduction.

When Zimmermann, therefore, holds the bone-conduction not directly comparable with the air-conduction, because in the former the vibrations in the handle, while in the latter the vibrations in the prongs, are auscultated, the objection may be accounted as justifiable.

His further conclusions, which seek to overthrow the whole generally rather valuable theory of sound-conduction in the ear, will be as little followed by most physiologists and otologists as by myself, and I, myself, see the less occasion any nearer to agree to the same, since he, in his tuning-fork experiments, presents an arrangement which appears up to the present as not qualified to yield serviceable results.

For instance, Zimmermann compares together tuning-fork handle and ends in like attitude before the ear canal

¹ Upon a skull devoid of soft parts the tuning-fork rings longer; the soft coverings of the skull exercise therefore a similarly strong damping influence on the vibrations of the tuning-fork, as does a piece of rubber on the table.

("Stimmgabelstiel und-Enden¹ miteinander in gleicher Haltung vor dem Gehörgang").

At all events, it would seem that he holds the tuning-fork handle, as well as the prongs, in the direction of its length before the ear canal.

It is easily understandable that Zimmermann thereby obtains very much shorter durations of hearing for the handle than for the prong ends, when we figure to ourselves the mechanism of the vibrating tuning-fork.

A tuning-fork which vibrates with its fundamental tone remains, as is known, on both its nodal points, which lie at complete rest, opposite to each other near its lower prong ends. The great amplitudes, which both prongs execute with their upper ends, correspond to small amplitudes, which the arch enclosed between the two nodal points of the tuning-fork produces. The radius of the arch is larger while the prong ends are farthest apart—*i. e.*, the arch flattens; the radius is smaller while they approach—*i. e.*, the arch projects towards the handle. The handle itself does not generally vibrate independently, but conveys only the movements of the arch away, and indeed the handle itself moves only in a purely longitudinal direction, while the prongs vibrate in a transverse direction. So long as the prongs still move, the arch of the fork and, with it, the handle can never come completely to rest.

Air condensation and rarefaction can only exist in the direction in which the prongs, as distinguished from the handle, move. But if the directions of vibration occur perpendicularly to each other, then the vibrations of the prong ends are most completely heard when their lateral surfaces, so far as possible, stand parallel to the tympanic membrane—*i. e.*, perpendicular to the axis of hearing, or, what amounts to the same thing, when the fork is turned 90° on its axis and the space between the prongs is before the ear canal. But the vibrations communicated from the arch to the handle are only heard when it is held in the prolongation of the axis of the ear canal—*i. e.*, with its end towards the ear canal.

¹ Compare "Unzulängliche Stütze der Helmholtz'schen Theorie," etc. *Zeit. f. Ohrenh.*, Bd. xxxvi., S. 209; and *ARCH. OF OTOL.*, xxix., p. 343.

What we hear when the handle is placed lengthwise of the auricle is probably only the vibrations of prong ends conveyed through the air to the ear and the smaller vibrations of the nearer-lying arch. Thereby comes into play, according to the manner in which the tuning-fork is held, in a wholly uncontrollable way, the interference which exists, as is known, in the direction of the four tuning-fork edges.¹

But there is another simple method by which we can also bring the shock of the tuning-fork arch communicated to the handle into most effectively favorable direction to the axis of the canal, and by this means also experimentally show easily the correctness of the theoretical postulate that the vibrations of the arch communicated to the handle last as long as those of the tuning-fork prongs.

At the eighth meeting of the German Otological Society, I briefly described an experiment, which I beg to present more fully, because it offers a general therapeutical interest, in so far as it allows us to compare air- and bone-conduction in a more exact way than was possible by the former use of the Rinne experiment.

The experiment is as follows:

If the tuning-fork *a*¹ be placed first with its handle upon the mastoid portion, then held with its prongs directly before the ear canal, until in both places, one after the other, it has ceased to be heard, and we then place its rounded-off handle with moderate pressure within the ear canal so that the lumen is closed, this tuning-fork is once more heard on the average for twelve seconds longer.

In the same manner the whole remaining lower and higher tuning-forks are heard a greater or lesser number of seconds when their handles are so placed in the ear canal, after their prongs have ceased to be heard before the ear canal.

Only with the very high tuning-forks, from *c*^{IV} upwards, does this experiment fail (which, because of their far-reaching audibility by air-conduction, we need not wonder at).

By this experiment is shown directly and incontestably the

¹ When we auscultate the tuning-fork on its prong ends, and instead of the surface or the space between the prongs hold one of its four lateral edges before the ear canal, the duration of hearing is thereby alone shortened to about one third—*e. g.*, for the *a*¹ tuning-fork used by me to 26 seconds on the average.

superiority of air-conduction over bone-conduction for the vibrations of the deeper tuning-forks.

This is evident from the following reflection :

As above related, the tuning-fork a^1 after having ceased to be heard on the application of its handle to the base of the mastoid portion directly behind the auricle, will be heard thirty seconds longer by the normal ear when its prongs are held next to the meatal orifice.

Up to the present, it is not permitted to draw from this result the positive conclusion that the air-conduction really excels in duration the bone-conduction, since hereby, as already has been dwelt upon, the experimental arrangement is different for testing the bone- and air-conduction.

But when we now likewise measure the last remnants of air-conduction through the handle, since we place the handle quite in the same direction and with the same pressure into the ear canal as before on the mastoid portion, both time measurements become directly comparable with each other.

Also the distance of the end of the handle from the cochlea remains in both these latter experimental arrangements at least nearly the same.

Consequently the new experiment demonstrates not only a distinct predominance of the air-conduction over the bone-conduction, but it permits also to determine the superiority of the air-conduction for each individual tuning-fork in correct proportions.

For my a^1 tuning-fork this superiority amounts to $30 + 12$ seconds, as the above numbers show ; *i. e.*, after it has ceased to be heard on the mastoid portion, the vibrations of its prong ends are still heard 30 seconds longer before the ear, and the vibrations of its handle placed in the ear canal are audible still 12 seconds more.

But since, as above stated, the fork expires quicker by the pressure of the handle upon the walls of the ear canal than when the handle is held free, this superiority would, in truth, be still greater than $30 + 12$ seconds, if we could measure it in real air-conduction duration ; *i. e.*, if we were able to advance the prongs as near to the tympanic membrane as we are able to do with the end of the handle of the fork.

A CLINICAL AND HISTOLOGICAL CONTRIBUTION TO THE SARCOMATOUS TUMORS OF THE TEMPORAL BONE.

BY DR. F. J. HEGENER,

ASSISTANT TO THE OTOLOGICAL CLINIC OF THE UNIVERSITY OF HEILDELBERG.

Translated by Dr. O. JOACHIM, of New Orleans.

SINCE the publication of a complete collection of sixty cases of sarcoma of the temporal bone by Dr. Asch (1) in Strassburg, Leutert (2) published a case of endothelioma lymphaticum, Schmeden (3) one of small alveolar sarcoma, Haug (4) an endothelial carcinoma, Nadoleczny (5) an endothelioma, Joel (6) a sarcoma, and Haug (7) an inoperable case of melanotic sarcoma of the temporal bone. The publications of Stowers's (8) and Roncali's (9) cases have not been accessible to me. The only other case of melanotic sarcoma besides Haug's was reported by Kuhn (10), and was also inoperable. The following case of a melanotic and that of an alveolar sarcoma, in which operative interference was permitted at an early stage, furnished the opportunity of studying the destructive progress of the neoplasms.

CASE I.—Alveolar endothelioma of the temporal bone.
The family of a three-year-old boy is free from constitutional affections. The boy has been without ailment until four weeks previous to his admission. Since that time he has had pain in the region of right ear and neck, which compels him to hold his head in an oblique position. For the last two weeks he has had a discharge from the right ear, with pain and swelling of mastoid region. A paracentesis of the drum gave no relief, and when admitted to hospital the boy had no fever and appeared in good general

condition. Now the right auricle is pushed forward, the skin over the os planum red, glistening, swollen, and painful. Fluctuation present, and fluid pus in the depth of the slit-like, narrowed auditory meatus. Drum-head not visible; functional examination not practicable. The diagnosis of acute middle-ear and mastoid inflammation with subperiosteal abscess seemed assured. When operated upon, the skin incision disclosed at once a grayish-red, nodular round tumor, 1.5 *cm* in diameter, which had perforated the bone. It was adherent and protruded through the bone for 0.5 *cm*. This mass extended into the middle ear and, forming a perfect cast of the mastoid antrum and process, destroyed its septa and most of the posterior wall of the osseous meatus. The complete removal of the mass exposed the facial nerve for 0.5 *cm*. The nerve when touched produced some contractions of the corresponding side of the face. In the region of the destroyed upper posterior wall of the antrum the tumor was adherent to the dura, which seemed macroscopically intact but hard and thickened. An exploratory incision into the dura and into the sinus showed, with exception of condensation, nothing abnormal. The bony shell of the tumor was removed everywhere up to the point where the bone seemed healthy. This point could not be reached at the floor of the middle ear. The mastoid tip was resected and the membranous ear canal slit in the centre and tamponed against the upper and lower exposed surface. The temperature reached 38° the following day, remained normal for two days, reached 40° on the fourth day, and receded after opening of an abscess in the sterno-cleido-mastoid muscle to 38.5°, where it remained without great fluctuations. The patient gradually lost ground without sign of local recurrence, metastasis, or pyæmia. The appearance and healing of the operation wound were very satisfactory. The patient withdrew from personal observation for the subsequent eleven weeks, during which the temperature of 38.5° continued and often reached 40° in the evening with a cough and expectoration. When again examined the patient had a dirty yellow skin and eczema of the head and back. The region of the operation was entirely epidermatized excepting a small granulating surface near the floor of the middle ear. No local recurrence or facial paralysis or enlarged neighboring glands were noticed. A flat, oval, painful, immovable tumor, 5 x 3 *cm* in diameter, centrally fluctuating, hard and resistant in the periphery, covered with thin, inflamed, tense, and shining epidermis occupied the right frontal

eminence. A tumor of similar character, of half-egg size and shape, involved the fourth rib in the anterior axillary line. Dulness on percussion and lessened vesicular breathing existed in a radius of 2 *cm* around the immovable tumor, which restricted respiration and the thoracic movement. A deep-seated, immovable, hard swelling existed at the junction of the middle and upper thirds of the forearm. Death six weeks after last examination.

Autopsy.—A pale red, centrally purulent tumor, 5 x 2 *cm* in diameter, involving and destroying the right fourth rib and part of sternum, extends for 4 *cm* into the lung tissue, obliterating the pleura. The tumor over the frontal eminence, noted in the above history, contains a teaspoonful of thick pus under pressure. A sharp, rough-edged, perfectly round defect, 35 *cm* in diameter, is situated 4 *cm* above the incisura supraorbitalis, exposing the strongly adherent dura mater, which is covered by its mass. The inner surface of the dura shows only vascular injection without infiltration and is, except at this location, normal and easily detached. The dura, brain, and vessels show no notable alterations. The right temporal bone, portions of the frontal and thoracic metastatic tumors, as well as of the heart, kidney, liver, and spleen, were removed for microscopic examination and put in a 10% solution of formol. The temporal bone was decalcified at the end of two weeks in a 40% solution of formol 10.0 cc, pure nitric acid 10 cc, water 80.0 cc, which had been renewed several times. Then it was embedded in celloidin and cut into sections vertically to the long axis of the petrous bone.

Microscopic examination.—1. Sections of the lobulated tumor removed during the operation show under moderate amplification cavities filled with fresh red blood corpuscles. Strands of varying thickness of very fine, highly stained connective-tissue fibres (Van Gieson's stain) enclosing blood-vessels, unite and form meshes which contain aggregations of light brown cells. This prevailing organoid type is often rendered indistinct by the faintness of the stain or cell-aggregation and freshly extravasated blood or by acute inflammatory processes within the tumor productive of round-cell infiltration with molecular degeneration. The surface of the tumor is made up of flattened tumor cells. The portion removed from the middle ear shows a covering of normal tympanic membrane as described by Kessel (11). In

the tumor mass are found many bony trabeculae derived from the ossicles or mastoid cells with lacunar arrosion, and in the process of resorption.

When examined under high power, large masses of cells are seen adjacent to the well-developed framework, which surrounds the blood-vessels. Their endothelium consists of several layers of pale brown cells protruding into the lumen, which is surrounded by a distinct mantle of very small bright red nucleated cells. From these cells a network of highly colored fibrillae project and form, with the well-stained fibrillae of the connective-tissue cells, the fine framework of the tumor. The nuclei of these cells are sparse, thin, and fusiform. The slitlike spaces between the fibrillae must be regarded as lymph passages, which contain cells of various sizes with bright molecular protoplasm and a small dark or large light brown nucleus and nucleolus. Their relation to the fibrous wall is either parietal or they are arranged in rows on either side. From the proliferating endothelium of the lymph passages the fibrillae project everywhere into the masses of large cells, which they enclose singly or in numbers. The cells are large, polymorphous, and edgewise compressed, with an oval or kidney-shaped nucleus and dark nucleolus. Mitoses and giant cells are rare. They frequently bear a close resemblance to cubic epithelium. These cell-masses are identical with and derived from the endothelium of the lymph passages. The lumen of the blood-vessels is in many places obliterated by proliferating endothelium, or a thick proliferating mantle of endothelium extends outward like those seen in angiosarcoma.

The neoplasm is composed principally of the endothelium of lymph-vessels, of connective tissue, and in a moderate degree of blood-vessel endothelium. The alveolar structure is characteristic in the specimens of recent growth. The present writer prefers to call this kind of a tumor an alveolar endothelioma in preference to the usual appellation of alveolar sarcoma, large round-cell sarcoma, or endothelioma lymphaticum.

2. Sections of the petrous bone obtained from the body at the autopsy, 5 months after the operation.

The wound of operation has cicatrized except below the promontory where the masses of young connective-tissue cells cannot with certainty be differentiated from sarcomatous cells. Within the cicatricial tissue a few strands of curled striated, strongly refracting, unstained cotton-fibres are enclosed by large giant cells. The facial nerve is preserved intact; the stapedius muscle and tensor tympani are atrophic and degenerated.

On the exposed surfaces no recurrence took place and it is therefore of interest to note the intense progress of the neoplasm within the petrous portion, which left only the hardest parts of the bone, the lamina vitrea, the labyrinth capsule, the facial and carotid canals, free from invasion.

The progress of the tumor extends to the tip of the pyramid and fills all the free spaces of the diploic bone. The invasion of the walls by the tumor elements of the lymph passages causes their gradual breaking down and the formation of lacunæ without giant cells. The connective tissue of the Eustachian tube is infiltrated down to the isthmus. The lateral sinus, jugular vein, and dura are normal.

3. Microscopic examinations of the metastatic tumors show their sarcomatous nature. The lacunar destruction of the bone and the proliferation of the tumor into the lacunar spaces is here equally evident. In the attached lung the disease progresses along the interalveolar tissue and leads to compression of the alveoli and bronchi. The pleura is, at the point where the tumor is adherent, not discernible. The other organs removed are normal. The early and simultaneous appearance of metastatic tumors on the forearm, forehead, rib, and lung appears to the author to be caused by dissemination through the vascular system during the operation of an infected embolus, primarily into the lung and from there to the forehead and forearm. In this particular this case differs from Kuhn's (10), in which metastatic tumors occurred a considerable time after the operation, and indicated a general malignant infection. The point of origin of the tumor is difficult to determine with certainty. He believes with Schwartz (12) that this variety of tumor starts from the dura. The course and progress of the neo-

plasm, and the fact that the most recent formation was found in the tympanum, point to this origin. The local non-recurrence indicates the superficial layer of the dura as the starting-place. To this view of Schwartz, the histologically analogous case of Leutert (2), which started from the floor of the tympanum, forms a notable exception. Considering the rapid progress and destruction in the direction of least resistance, the author believes the prognosis in childhood, where diploic bone is predominant, to be necessarily bad, and the progress of the disease farther advanced than can be macroscopically determined. In the adult the conditions are more favorable, and two authenticated cases have been cured. The occurrence of metastases has caused Schwartz to express his disapproval of operating on any malignant disease of the ear as hastening the fatal issue. The perfected operative technique of to-day somewhat lessens the importance of this opinion, though the above case seems to support it.

CASE 2.—Melanotic sarcoma of the right ear in a female patient forty-four years old of good previous history. Deafness existed for six months, purulent discharge for two weeks, following an attack of earache, which still continues. Right facial paralysis four days. For some time past a bloody discharge from nose. General condition upon admission good, pale complexion with numerous pigmented nævi-chronic pharyngitis, right choana narrowed by swollen mucous membrane. Fœtid discharge from right ear, which contains a grayish-red polypus. Pain on pressure over mastoid, no swelling. Left drum dull with shortened right reflex. Weber R > L. Rinne R —, L +. Bone condition not shortened. Whispering R before ear, L 13.5 m. On account of these conditions the operation of the radical opening of the middle-ear cavities is performed after removal of the aural polypus. Thickened periosteum and discolored thin cortex cover the large cavity of antrum and cells, which contain decaying, blackish granulation tissue. Their color, their penetration into the entire cancellous substance, and the presence of bone within the granulations justified the diagnosis of a malignant growth. Hard masses, occupying the tympanum and attic and enclosing the ossicles, are removed. The destruction of the roof of the tympanum and

antrum exposes the dura, which is discolored, covered with blackish masses, and perforated. The facial nerve is exposed for some distance, and when touched is without action on the facial muscles. The posterior part of the membranous canal is split and tamponed upward and downward in the usual manner.

With the prompt subsidence of pain the general condition of the patient improved and the wound completely cicatrized in ten weeks. When examined six weeks after the operation a grayish, movable, easily bleeding tumor with blackish spots is observed occluding the right side of the nose. In the post-nasal space the lobulated black tumor occupies the entire right choana, the mouth of the tube, and one third of the pharyngeal wall to the level of the floor of the nose. Two weeks later the tumor extends across the left choana, the pharyngeal wall is pushed forward to the mouth of the left tube, and a new deposit is observed on the left side of the naso-pharynx. A piece of the tumor is removed for examination; its entire removal under these circumstances is not contemplated. Two months and a half after the operation facial erysipelas appeared, from which she recovered, but the tumor did not change.

Microscopic examination of the hardened and decalcified mass shows the ossicles contained in the section and well preserved, with some remains of the drum membrane. The surrounding tumor masses contain bony particles and pigment in all stages of development. Fresh blood is seen between the nodules of the tumor which, in the vicinity of the processus brevis, shows an alveolar structure and an epidermal coat of varying thickness and containing epithelial pearls. The lymphatic passages of the underlying neoplasm contain rows of strongly pigmented cells without visible nuclei. The cells are frequently arranged in radiating order around the cross-section of the blood-vessels. The alveolar structure becomes apparent in the deeper tissue, where the vessels are surrounded by large spindle cells with dark oval nuclei, and fine long processes forming a reticulum for compact masses of well-developed, often pigmented, cells. The numerous blood-vessels, with their endothelium, are easily recognizable. The pigment gives no iron reaction. The tumor mass of the mastoid and antrum shows the alveolar structure only under high power. **Diagnosis.**—*Melano-sar-*

coma. The tumor progressed by proliferation into the cavities lined with mucous membrane or periosteum. The cell invasion of the lymph passages of the lining membrane leads later to destruction of the bone. This and the greater resistance of the canaliculi explain the preservation of the ossicles. The sheath of the chorda tympani is perforated by the neoplasm, and half of the nerve fibres are destroyed by pigmented tumor cells. The aural polypus is covered by mucous membrane, and is of a sarcomatous nature without alveolar structure, but with beginning pigmentation. The nasal and post-nasal tumors are also of the melano-sarcomatous type, with free vascular supply and pigmentation, but without distinct alveoli.

The origin of this tumor cannot well be surmised. In view of the prevailing opinion that melanotic tumors grow only where pigment exists, it is difficult to account for it in this normally unpigmented region. Haug observed a case from its incipency in which the ear canal, its starting-point, was free from pigmentation. The author admits, in his patient, the possibility of a *nævus* near the drum-head, but finds just in this region the youngest formation of the tumor and the least pigment. It is also of interest to note that the tumor in this instance did not progress in the direction of least resistance, but into the restricted space of the tympanum and tube. The nasal tumor could not have been diagnosed when the destruction in the ear had so far progressed. Haug consequently considers the ear tumor as unlikely to be a metastasis from the growth. In no case of Kümmel's (13) collection of eight cases of melano-sarcoma of the nose, nor in Schallcross's (14) case, has metastasis to the ear been observed. These cases derive their pigmentation from the olfactory mucous membrane. Some time previous the patient ligated a dark wart on the forehead with a thread. It is impossible to decide whether this could have given rise to migration of tumor cells.

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REPORT OF THREE CASES OF LIGATION OF
THE INTERNAL JUGULAR FOR SEPTIC
THROMBOSIS, FOLLOWING PURULENT OTI-
TIS MEDIA—RECOVERY.

By EDWARD BRADFORD DENCH, M.D.,

PROFESSOR OF OTOTOLOGY, UNIVERSITY AND BELLEVUE HOSPITAL MEDICAL COLLEGE; AURAL
SURGEON TO THE NEW YORK EYE AND EAR INFIRMARY; CONSULTING OTOLOGIST TO ST.
LUKE'S HOSPITAL AND TO THE NEW YORK ORTHOPÆDIC DISPENSARY AND HOSPITAL.

IN any case of general septic infection, it is the aim of the surgeon either to remove the focus causing this systemic condition, at as early a date as possible, or, if its removal is impossible, to isolate it completely from the general circulation. A septic thrombus of the lateral sinus, following inflammation of the middle ear, not infrequently extends downward into the internal jugular. As the clot becomes disintegrated, the characteristic symptoms of a septicæmia present themselves. While a certain number of these cases have recovered without operative interference, the majority terminate fatally, unless the condition is relieved by the surgeon. Ballance was the first operator to formulate a plan of procedure for the relief of the condition under discussion. Since the report of his cases, some fifteen years ago, the means of recognizing the condition have become more exact, while the operative technique has gradually been perfected.

In this paper, I desire to give briefly the history of three cases, in which early intervention undoubtedly saved the life of the patients.

The FIRST CASE was that of a young woman, who had suffered from a chronic suppurative otitis since childhood. On removing

the carious ossicles and curetting the tympanum, a dehiscence was found in the floor of the tympanic cavity. Although the curette was used with extreme care, the jugular bulb was entered. About four days after the removal of the ossicles, the patient began to develop symptoms of general sepsis. In addition to the constitutional symptoms, there was well-marked tenderness just below and in front of the mastoid process. An immediate operation was performed. The internal jugular was exposed from a point just below the omo-hyoid muscle, to the jugular bulb. On examination, a thrombus was found in the vein, at a point about a quarter of an inch below the base of the skull. The walls of the vein were inflamed and thickened for a considerable distance. The vessel was secured between two ligatures, just below the omo-hyoid, and all tributary vessels were tied off in the same manner and divided. Two ligatures were then passed about the vein, at the upper angle of the wound, as close to the base of the skull as possible. The entire portion of the vein involved was then carefully dissected out. The temperature at once fell, and the patient made an uninterrupted recovery. At the time of the operation, both sinus and jugular bulb were thoroughly explored, and found to be in normal condition. It was evident, therefore, that septic infection did not occur as the result of puncture of the bulb itself, but rather from denuding a large surface within the tympanum, giving free access to infectious material.

The SECOND CASE was that of a man, about thirty years of age, who had been suffering from an acute purulent inflammation of the middle ear for about eight weeks. When I first saw him, there were marked signs of inflammation of the mastoid process. The typical mastoid operation was done, and on removing the carious bone the sigmoid sinus was exposed. As the walls of the sinus seemed thickened, the vessel was opened, and a small clot was removed. The patient did well for about a week, at the end of which time symptoms of profound sepsis appeared. In this case, the jugular was exposed from a point just above the clavicle, to the base of the skull. Both the vein and its tributaries were filled with a clot in a state of decomposition. The technique of the operation was carried out precisely as in the former case, and the patient made a complete recovery.

The THIRD CASE was that of a young man who came to the Hospital with a history of acute inflammation of the middle ear, followed by characteristic symptoms of mastoid involvement. The

mastoid was immediately operated upon, and the internal table of the skull, covering the sinus, was found to be involved. The external wall of the sinus was extremely thick, and upon incision no bleeding occurred. By means of the curette, a firm clot was removed from the lumen of the vessel. The curette was carried first upward toward the torcular, and then downward toward the bulb, until fairly free hemorrhage followed. Owing to the fact that the case only came under observation on the day of the operation, I determined to postpone further operative interference until more exact observation could be made of the temperature record. About thirty-six hours after the first operation, characteristic symptoms of systemic infection made their appearance. Upon exposing the internal jugular, the vessel and its tributaries were found to be entirely filled with a soft clot. The disintegration of the walls of the vessel had been so extensive that the vein could only be secured by pulling it forcibly upward from beneath the clavicle. After passing two ligatures about the vein as low down in the neck as possible, it was divided between them. The tributary vessels were so much involved that it was impossible to ligate them alone. The only way that they could be secured was to include a small amount of muscle or fascia within the ligature. Very free hæmorrhage occurred in this case, and it was absolutely impossible to dissect out the vein. Every tributary was carefully sought for and ligated. Several large lymphatic glands were removed. Two ligatures were then passed about the vein, close to the base of the skull, and the vessel divided between them. As the septic focus was thus practically isolated, and as it was impossible to remove the vessel completely, I deemed it perfectly safe to pack the wound firmly with iodoform gauze, feeling sure that no further infection could occur. This patient recovered perfectly, and was discharged from the Hospital about three weeks after the operation.

While it is always wise to remove the vein, if this can be done, the last case proves conclusively that, in those instances where the walls of the vessel have become so much involved as to prevent this procedure, a careful isolation of the septic area will prevent further systemic infection.

REPORT ON THE PROGRESS IN OTOTOLOGY FOR
THE SECOND QUARTER OF
THE YEAR 1900.

By DR. A. HARTMANN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY AND PHYSIOLOGY OF THE EAR.

114. KIESOW and NADOLECZNY. The psycho-physiology of the chorda tympani. *Zeitschr. f. Psychologie und Physiologie der Sinnesorgane*, vol. xxiii.

115. SCHWENDT. Observations on the upper limit of human hearing. *Arch. f. Ohrenhkk.*, vol. xlix., p. 1.

116. KÖNIG. The static functions of the labyrinth. *Arch. internat. de laryng., d'otol.*, vol. xiii., No. 2.

114. These authors examined the sense of taste in two cases of chronic purulent otitis which had been operated upon by stimulating the chorda tympani nerve mechanically and with the constant electric current, and also testing the taste on the tongue. The experiments confirm the view that the taste fibres for the anterior two-thirds of the tongue are supplied by the chorda tympani, and that after destruction of the chorda the taste faculty is lost on the corresponding position anterior to the follicular area. On touching the chorda pain was experienced in the molar teeth and in the tongue (trigeminal reflex). BRÜHL.

115. SCHWENDT examined several normal hearing persons with the improved Edelman's Galton whistle to determine the upper tone-limit. He found that a tone an octave higher could be perceived than with König's rods or tuning-forks. A man, aged sixty-nine, could hear d^8 (37,000 v. d.), several younger persons attained fis^8 (48,000 v. d.) and even higher. The upper limit for young people is between c^8 and fis^8 . Schwendt proposes to

designate tones above c^5 produced by the organ and piccolo as ultramusical. Compact bodies do not produce a higher tone perceivable by man than f^7 . Edelmann can now produce a tone of 170,000 v. d., or almost f^{10} , demonstrable with Kundt's dust figures. BLOCH.

116. KÖNIG reviews the experiments and opinions of previous authors. He experimented with doves and found that the effects of Flourens's test (section of semicircular canals) could be obtained when the membranous semicircular canals are exposed and anæsthetized with cocaine. Hence Flourens's symptoms are due to a loss of function of the semicircular canals and not signs of irritation. SCHWENDT.

GENERAL.

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117. GRUNERT and ZERONI. Annual report of the Halle Ear Clinic for 1898-99 and 1899-1900. *Arch. f. Ohrenhkl.*, vol. xlix., pp. 97-237.

118. TOMKA. The relation of the facial nerve to diseases of the ear. *Arch. f. Ohrenhkl.*, vol. xlix., p. 24.

119. BEZOLD. Ear oils and other ear drops on public sale. A contribution to the crusade against quackery. *Aerztl. Vereinsbl.*, No. 422, 1900.

117. The reports contain the usual notices on the work done at the Halle Clinic with its steadily increasing numbers. A large number of case histories with remarks and occasional autopsies are added. BLOCH.

118. A very instructive, carefully prepared, and readable monograph on this subject. After a description of the anatomical relations of the facial nerve the etiology is discussed, taking cold, diseases of the external ear (zoster, cerumen, otitis ext.), in which the facial paralysis is supposed to occur reflexly. The acute catarrhs and inflammations of the middle ear, the chronic suppurations including the tuberculous, and the accompanying carious destructive processes in the temporal bone are next treated with due consideration of the literature. Further causes mentioned are trauma, direct injury to the Fallopian canal or following suppurative diseases, fractures of base, operations, etc., new growths in the canal, polypi, sarcomata, carcinomata, cholesteatomata, exostoses, and others; finally tumors at certain parts of the base of the

skull. Endocranial complications may also cause paralysis. The facial nucleus may be affected and contralateral paralyses arise, or the trunk on one side may be invaded. The succession of paralyses may determine the site of disease as of an abscess. Slow and late appearing facial paralysis indicates a tuberculous process. The paralysis has been observed in sinus thrombosis. The anatomical changes are inflammatory or atrophic—degenerative in nature. The nerve is quite resisting; extension per Fallopian canal to the cranial cavity has been observed without paralysis. The nerve, as is well known, is very susceptible of regeneration.

Pains about the ear and side of face, tinnitus, and disturbance of taste may appear prodromally. Besides the generally known signs of the paralysis and salivation, disturbances of smell are mentioned. Tinnitus and deafness without evident changes in the ear may be due to a simultaneous labyrinthine hyperæmia. If the palate is also paralyzed, the incomplete ventilation of the Eustachian tube and its results may be present.

If the paralysis disappears, the various groups of muscles resume their activity at different times. Paralyses in childhood may influence the bony development on the corresponding side.

The diagnosis is usually easy; the reaction of degeneration is usually present only in peripheric paralyses; combined with one-sided deafness suggests a tumor in the internal auditory meatus.

The prognosis is generally more favorable in children than in adults, in acute than in the chronic, such as tuberculous, syphilitic, cachectic. A favorable sign is the continuation of the normal reaction of the nerves to electric stimulation or its return; unfavorable is the absence of electric reaction, muscular atrophy, sudden total paralysis, loss of sweating on the same side.

Treatment in the acute and chronic forms depends on the locality of the morbid process and not on the paralysis itself. Galvanic treatment is of slight avail. BLOCH.

119. BEZOLD speaks of the prominence given to the ear oils in the home treatment of ear diseases. Most of Bezold's cases of otomycosis had instilled oil in the ear a short time before the development of the fungus. In 29 of 48 cases inflammatory conditions were present. The mycelium enjoys a much more exuberant growth in the presence of oil. Finally attention is drawn to danger of instillations and syringing in ruptures of the membrana tympani and fractures of the base.

HARTMANN.

b.—GENERAL SYMPTOMATOLOGY AND PATHOLOGY.

120. EITELBERG. What relation has agorophobia to certain diseases of the auditory organ? *Wiener med. Presse*, No. 28, 1900.

121. BOULAI. Hemorrhages of the drum membrane, middle turbinate, and soft palate at the menopause. *Arch. internat. de laryng.*, etc., vol. xiii., No. 2.

122. BOULAI. Voluntary contraction of the muscles of the tympanic membrane. *Arch. internat. de laryng.*, etc., vol. xiii., No. 2.

123. ROHRER. On the connection of neuralgic diseases of the ear, otalgia nervosa, with diseases of the teeth, the mouth, and naso-pharynx. *Schweizerische Vierteljahresschr. f. Zahnheilk.*, vol. x., No. 2.

124. PETYT, R. Pin introduced into the ear passed per anum. *Brit. Med. Jour.*, June 30, 1900.

120. The relation is a very loose one. In a case of EITELBERG's agorophobia appeared after excessive administration of thyroid tablets given for weeks in chronic aural catarrh. Treatment was psychic.

POLLAK.

121. In a woman of forty-two, at the menopause, blood vessels appeared on the turbinates, drum membrane, and soft palate. This appearance recurred regularly and was accompanied by neuralgic and general headache. The nervous condition grew worse and the patient had to be put in an asylum.

SCHWENDT.

122. BOULAI observed two cases where a distinctly audible, crackling noise occurred 130 times a minute. In one of the cases the drum showed a simultaneous vibration. The noise could be produced at will. The author considers it to be due to contraction of the tensor tympani.

SCHWENDT.

123. ROHRER discusses the causes of otalgia nervosa and the nerve channels by which this is produced. He mentions that the pain may also be localized in the mastoid process. Two case histories are reported.

HARTMANN.

124. A man aged twenty-two years had suffered from otorrhœa and deafness for many years. A few days before coming under observation, a pin, which he had introduced into the right meatus to clear the passage, slipped inside altogether. While PETYT was proceeding to make an examination, the patient exclaimed suddenly that "he felt it in his throat." Examination for the pin in

the ear and throat was negative. Two days later pain in the stomach was felt. The next day, when he was about to have a motion of the bowels, he felt a slight prickling sensation. On examining the stool the pin was found. CHEATLE.

c.—METHODS OF EXAMINATION AND TREATMENT.

125. BEZOLD and EDELMANN. A new method to determine the quantity of hearing with tuning-forks (method of Schmiegelow). *Arch. f. Ohrenhkl.*, vol. xlix., p. 3.

126. BEZOLD. Results of functional examination with the continuous-tone series, especially in deaf-mutes. *Münch. med. Wochenschr.*, Nos. 19 and 20, 1900.

127. NEUBAUER. A watch (otometer) to examine the hearing. *Pejógydszat*, June 3, 1900.

128. MIGNON. Nirvanine in the nose, ear, and throat. *Arch. internat. de laryng.*, vol. xiii., No. 2.

129. JAENICKE. Some new nasal instruments. *Deutsche med. Wochenschr.*, No. 25, 1900.

130. DENCH, E. B. The importance of a careful functional examination in chronic inflammation of the middle ear. *N. Y. Eye and Ear Inf. Repts.*, January, 1900.

131. GRAY, ALBERT A. The production of local anæsthesia in the ears. *Lancet*, April 21, 1900.

132. GLEASON, E. B. Uses of silver salts. *Laryngoscope*, March, 1900.

133. GOLDSTEIN, M. A. What not to do in ear, nose, and throat disease. *St. Louis Med. Review*, June 2, 1900.

125. BEZOLD and EDELMANN in their critical review of Schmiegelow's paper (*Arch. f. Ohrenhkl.*, vol. xlv., p. 164) claim that in experiments with larger tuning-forks it is incorrect to take amplitude in the square of the distance from the ear as is usually done. The vibrating surface of the blades of the fork are several times greater than the diameter of the meatus. This law holds good only when the sound emanates from one point. Tuning-forks are unsuited to measure hearing distance, as is well known. According to Vierordt, amplitude decreases in simple ratio to the distance from the source of sound in the open air. BLOCH.

126. BEZOLD reviews briefly the results of the functional examination of hearing with the continuous-tone series, from the standpoint of physiology and pathology, especially in the case of

deaf-mutes. The hearing and singing instruction of eleven partly hearing deaf-mutes was described by Keller, and Edelmann demonstrated the highest number of vibrations in the Galton whistle with the Kundt dust figures. SCHEIBE.

127. NEUBAUER describes a cylindrical clock with stop arrangement which had been devised by Bing many years ago. POLLAK.

128. Nirvanine is less toxic than cocaine, and is especially useful for infiltration anæsthesia. It can be employed with advantage in the neurasthenic and in those with weak heart. SCHWENDT.

130. In order to make a functional examination of the ear at all reliable, DENCH believes that each instrument used should be accurately tested. Several methods are given in detail to aid one in making an exact estimate of the actual rate of vibration (Schwingungszahl) of tuning-forks. To determine defects in the lower scale, forks from 16 to 100 double vibrations are suggested. In order to exclude disease of the conducting apparatus, the lower tone-limit must be determined. A fork of 256 (c') double vibrations is preferred for the bone determination. All forks must be free from overtones. The Galton whistle is used to examine the upper tone-limit. It is fairly accurate as far as 35,000 vibrations per second. CLEMENS.

131. GRAY finds that the following solution will produce anæsthesia of the healthy membrane; ten drops being allowed to remain in the meatus for from three to five minutes: Cocain. hydrochlor., five parts; rectified spirit, fifty parts; anilin oil, fifty parts. He has used it for incising the membrane for exudation in the middle ear with total absence of pain; and in curetting for granulations it has been successful. He sometimes uses, in certain cases, the following stronger solution: Cocain. hydrochlor., ten parts; absolute alcohol, thirty parts; anilin oil, pure, seventy parts. He thinks that water is abstracted from the tissues, so allowing the solution to pass through the deeper layers to the nerve termination. CHEATLE.

132. Four cases are reported where protargol was used, and from the prompt results following GLEASON is led to believe that it is an antiseptic astringent superior to any other in use. Unlike silver nitrate, it is unirritating to the pharyngeal wall, the atrium, and the external auditory canal. CLEMENS.

133. GOLDSTEIN refers in his paper to the abuse of the syringe

in removing foreign bodies, especially those of cereal character, from the external auditory canal. He thinks that the use of the syringe should be limited to the removal of cerumen. Instillation of thick, heavy oils for the relief of pain is condemned. On account of the danger of fluids finding their way into the Eustachian tubes, the use of the nasal douche is considered dangerous. The use of inflation in acute otitis media and acute coryza is denounced. Very high air pressure for the manipulation of the spray often produces irritation and causes damage instead of benefit. Cocaine should be used only for diagnostic purposes.

CLEMENS.

d.—DEAF-MUTISM.

134. GUTZMANN. Deaf-mutism. *Berliner Klinik*, No. 2.

135. SCHMIDTMANN. The first course for physicians at the Royal Deaf-Mute Institute in Berlin from May 14 to July 2, 1900. *Vierteljahrschrift für gerichtliche Medizin*, vol. xx., p. 177.

136. NEUERT. The faculty of hearing and lip-reading. *Med. pedagog. Monatsch. f. d. gesammte Sprechheilkunde*, tenth year, Nos. 1 and 2, 1900.

137. BROOKS, W. K. The inheritance of deafness. *Johns Hopkins Hospital Bulletin* No. 110, May, 1900.

138. MOFFAT, L. The development of hearing in the congenitally deaf. *Four. of Ophth., Otol., and Laryngol.*, Jan., 1900.

134. GUTZMANN describes the method by which a deaf-mute is taught to speak by use of the eye and the tactile sense. The method by the eye is the more important, though hearing remnants can be employed to develop the speaking powers.

BRÜHL.

135. It is inconceivable to what results statistics may be employed. NEUERT examined nineteen deaf-mutes, of whom four had had aural speaking exercises for one year, to study the relations of hearing to lip-reading. He concludes that the results favor the lip-reading. The results are, however, unreliable, as his premises are wrong. The time spent in speaking exercises by the ear, scarcely four hours a week, is in no proportion to the length of the instruction in lip-reading.

PASSOW.

137. BROOKS shows, from a study of the statistics of Professor Fay, of Boston, that deaf people are more likely to have deaf offspring than are hearing people, although they are more likely to have hearing than deaf children. Deaf persons are divided into

congenitally deaf and adventitiously deaf. The transmission is about 30 per cent. for the congenital group, and less than 5 per cent. for the other.

Further, it is shown that marriages between persons whose relatives have deaf children give nearly 40 per cent. of deaf offspring, while marriages among those whose relatives were not known to have deaf children give only $1\frac{1}{2}$ per cent. of deaf children. Deaf persons without deaf relatives may marry, therefore, with comparative safety. It appears that a hearing person with deaf relatives is as likely to transmit deafness as a deaf person, so the danger really lies in having deaf relatives. Neither deaf persons nor hearing persons with deaf relatives should marry, and they certainly should not marry persons with deaf relatives.

Transmission of deafness is greatest where the parties having deaf relatives marry their relatives. Where the marriages are consanguineous between persons with deaf relatives, the percentage of transmitted deafness is over 50. CLEMENS.

138. The principle underlying MOFFAT'S method to develop the hearing in the congenitally deaf is to watch the mouth of the teacher and see that, when certain motions are made, vibrations follow which produce a sound, and these sounds constitute a word. As soon as the patient becomes familiar with the fact that *b* and *oy* mean *boy*, the sound is made in his ear, with or without a hearing-tube, and he is made to understand that the noise he now hears is the word he has lately learned; gradually one word after another is added to his vocabulary and one noise after another withdrawn.

In testing, it is difficult to ascertain how much hearing a child possesses, for he does not seem to know what to expect, nor what is expected of him. Moffat found in many instances that an observer could discover in the eyes of the child when the first sensation was felt or heard. He believes great good may be accomplished, and the deaf much benefited by careful teaching along the lines of *perception* (*Wahrnehmung*). CLEMENS.

EXTERNAL EAR.

139. MACASKIE, J. G. Removal of a foreign body from the ear. *Lancet*, June 2, 1900.

140. BELLows, HOWARD P. Caries of the external ear-canal. *Homœopathic Four. of Eye, Ear, and Throat*, April, 1900.

139. A boy pushed into the right meatus a piece of india-

rubber which had previously been attached to a lead-pencil. As it fitted the passage so exactly, ordinary means of extraction failed. A small piece of twine, with the end teased out and thoroughly coated with seccotine, was pushed tightly against the rubber and kept in position for twenty-four hours. At the end of that time the twine was removed with the rubber attached.

CHEATLE.

140. BELLOWS reports a series of unusual cases to demonstrate how carious diseases can extend from the attic or from the mastoid cells to the external ear-canal; or how caries may originate in the auditory canal independently, and how treacherous its development may be. The occurrence of caries of the posterior-superior wall, due to extension of caries of the malleus, or from middle-ear suppuration, is not touched upon.

The anterior wall appears singularly exempt from carious disease.

CLEMENS.

MIDDLE EAR.

a.—ACUTE OTITIS MEDIA.

141. VEILLARD. A study of middle-ear disease in new-born and sucklings.

142. STRAIGHT, HOWARD S. Otitis media. *Cleveland Four. of Med.*, May, 1900.

141. VEILLARD concludes from numerous operations and autopsies that in 100 new-born and sucklings dying in asylums, 35 to 40 suffer from middle-ear disease, where the diagnosis can only be made by the aural mirror, as there is no tendency to perforation of the drum-membrane.

BRÜHL.

142. STRAIGHT believes that it is impossible, in the beginning, to diagnose whether a given case will take the catarrhal or suppurative form of inflammation. He is not quite sure that a catarrhal case can become a suppurative one, but, if no meddling treatment be employed, a given class of cases are bound to result in resolution, just as sure as another class will result in suppuration in spite of all treatment. Rest in bed in any case is absolutely essential. A second means of treatment quite as important is the application of heat. Heat in no way aborts a threatened abscess, or prevents a catarrhal case from becoming suppurative, but it is an efficient means of controlling pain. Paracentesis is employed if these means prove of no avail in bringing relief.

Strict antiseptic precautions are observed. The Eustachian catheter is employed when discharge ceases. The use of inflation by Politzer's method is condemned in early stages of inflammation. At any time its therapeutic value is questioned. CLEMENS.

b.—CHRONIC OTITIS MEDIA.

143. PIERRE. Treatment of otorrhœa at the seashore. *Arch. internat. de laryng.*, etc., vol. xiii., No. 2.

144. SCHRÖDER. 130 ossiculectomies; a contribution to the treatment of chronic purulent otitis. *Arch. f. Ohrenhkl.*, vol. xlix., p. 17.

145. GOMPERTZ. The function of the ear canal after the radical operation. *Wien. med. Wochenschr.*, March 4, 1900.

146. FELT, CARL LEE. Iodine-bearing drugs in the treatment of chronic purulent otorrhœa. *N.Y. Med. Jour.*, June 23, 1900.

147. RICHARDS, GEORGE L. The treatment of suppurative otitis media in young children. *Med. News*, May 19, 1900.

148. REIK, H. O. Some interesting cases of mastoiditis. *Maryland Med. Jour.*, May, 1900.

149. LAKE, R. Complete ossiculectomy (removal of remains of drumhead, larger ossicles, and external attic wall) in chronic ot. med. supp., with analysis of fifty cases. *Lancet*, March 10, 1900.

143. The sojourn at the seashore has a favorable influence on scrofulous children with inveterate otorrhœa, as the nasopharyngitis is cured and the general condition improved. The local treatment must, however, be continued, combined with surgical intervention if necessary. Sea baths are only permissible exceptionally and with special precautions. SCHWENDT.

144. This is a report from Ludwig's clinic. Chronic otorrhœa was always the indication. About one half were cured. If the hammer was found carious, the anvil was also carious or destroyed, while with a carious anvil the hammer often showed no change. A marked improvement in hearing occasionally followed. The author thinks it his duty to draw renewed attention to this proceeding, especially as after the radical operation healing does not always take place. BLOCH.

145. To improve the hearing after the radical operation, GOMPERTZ uses a thick layer of insufflated boric powder to replace the drum. The author recommends the excision of the hammer

and division of the incudo-stapedial joint as a primary step in the operation and care in the introduction and holding of the Stacke's protector.

POLLAK.

146. After considering the merits of the various iodine combinations, FELT finds that *iodomuth* for insufflation has given him the most satisfactory results in the treatment of chronic middle-ear suppuration. Iodomuth is a bismuth powder containing twenty-five per cent. of iodine; it is odorless, impalpable, reddish-brown, and does not cake in the ear. It contains sufficient iodine to stimulate the tissues and to destroy the micro-organisms. It deodorizes the discharge, and a local sedative action is derived from the bismuth. His observations extend over a period of nearly two years.

CLEMENS.

147. The frequent occurrence of middle-ear suppuration in children is dwelt upon by RICHARDS, and in describing his method of handling such cases he confines himself in his paper entirely to the consideration of the local treatment.

In cases of long standing, with foul discharge and caries, he syringes the ear with warm sterile water, or a solution of bichloride of mercury 1:5000, until the parts are thoroughly clean. The canal is then dried and the ear inspected. Where there is much destruction of the tympanic membrane, hydrogen peroxide is applied on cotton pledgets, and, after drying, a solution of boric acid in 40 to 90 per cent. alcohol is applied in the same manner. Alcohol over 50 per cent. is seldom used in young children. The middle-ear surface is then dusted lightly with boracic acid, or some other similar drying powder, and the ear stopped with a small, narrow wick of iodoform gauze, care being taken that it reaches the bottom of the canal. In more acute cases, with a small perforation, thorough cleansing is employed, the use of boric acid, alcohol, hydrogen peroxide, and powders being omitted. The gauze wicking or cotton pledgets are inserted and changed frequently. Should the perforation be too small to ensure good drainage, a free incision at the posterior inferior quadrant is advised.

The successful continuance of the details of this treatment at the home of the patient, by the mother or attendant, is considered most essential. Elementary instruction is given in anatomy, manipulation, and technique to the person who attends the patient, in order to secure an intelligent application of the method.

CLEMENS.

148. Case 1.—Acute mastoiditis (Bezold variety) without perforation of the membrana tympani. Owing to a sclerosed external cortex of the mastoid, the inflammatory process broke down the cellular structure and internal wall of bone into the soft tissues of the neck. The tympanic membrane was never perforated, although active inflammation was prolonged in the tympanum. There was little fever at any time. Case recovered.

Case 2.—Fatal pyæmia from chr. supp. ot. med. Patient was a male, twenty-five years old, and had had discharging ears for past ten years, following an attack of scarlet fever. For a short time he had severe pain in the right ear extending over the temple and mastoid. No swelling or redness of mastoid integument at any time. After several severe chills and a temperature of 105.4° the mastoid was opened and only a few drops of pus were found in region of the sigmoid sinus. Upon opening the sinus a seemingly satisfactory flow from both ends occurred. Patient grew worse subsequently. Cranial cavity was explored with negative results. Death from septic pneumonia. Blood examination negative.

Case 3 was a male twenty years old. Discharge from right ear for last sixteen years. Pain and swelling over right mastoid for last four days; marked fluctuation. At the operation as soon as the knife divided the skin and periosteum fully 200 cc of pus was evacuated. Three months later a secondary operation was performed to close a fistulous opening over the antrum. On the external surface above, behind the antrum opening, there was a carious perforation 6 mm in diameter, covered with granulations. A thorough curetting released pus and cheesy material. Pus from the subdural abscess showed the presence of bacillus coli communis.

Cases 4 and 5 were simple, uncomplicated, acute mastoiditis. After a mastoidectomy each was healed in five days by the use of the blood-clot method.

CLEMENS.

149. Of LAKE's 50 cases of ossiculectomy for chronic suppuration, 42 were cured of discharge, and improvement in hearing was obtained in 21. The average duration of the disease was thirteen years. He advocates removal of the outer attic with the burr (Cheatle's), as an adjunct to the operation of ossiculectomy. The excellent results obtained are distinctly encouraging. A complete analysis is given.

CHEATLE.

Obituary.

DR. LAURENCE TURNBULL died at his home in Philadelphia, Oct. 24, 1900. He was born in Scotland, Sept. 10, 1821, emigrated to America when seventeen years old, studied pharmacy, graduating in 1842. His thesis was on salicine, the active principle of salicylic acid, which he had discovered, while a student, in the plant *Populus tremuloides*. Later he made the discovery that biborate of sodium bleached colored oils and ointments. He then studied medicine, entering the office of Dr. John K. Mitchell, the father of Dr. S. Weir Mitchell. He graduated at Jefferson Medical College, 1845. He served in the Philadelphia Hospital as resident physician, became connected with other charitable and teaching medical institutions, and served in the civil war as volunteer surgeon. He made a special study of ear diseases, and was a physician of eye and ear diseases in the Howard Hospital from 1857 to 1887. In 1877 he was appointed aural surgeon to the Jefferson Medical College Hospital and superintendent of the ear clinic. He may be considered as the first ear specialist in America and acquired an international reputation. He wrote a goodly number of articles on the ear. In 1881 he published *A Clinical Manual on the Diseases of the Ear*, which went through two editions. His *Manual of Anæsthetic Agents and their Employment in the Treatment of Diseases* has had four editions. He was the first in this country to perform the operation of opening the mastoid. He was invariably kind to his numerous patients and received a hearty recognition from his brother physicians of whom we may mention only Samuel D. Gross and H. Agnew. H. K.

(From a necrology in the *Public Ledger*, Phila.)

ABRAHAM KUHN, Professor of Otology at the University of Strassburg, whose death we announced in our last issue, was born in the Palatinate (Bavaria) in 1838, studied in Munich, Würzburg,

Giessen, and Vienna. He graduated, 1865, in Strassburg. Thesis : "On the Tumors of the Larynx." During the Franco-German war in 1870 he served on the French side under the International Red Cross. In 1873 he passed his examination as lecturer at the new (German) university of Strassburg and, admitted as Privatdo-cent of Otology, started a dispensary for ear patients, which in 1881 was extended and admitted to the university institutions with him as official [salaried] professor. In 1896 a large and appropriately equipped building was added as "University Ear Clinic" to the young and flourishing high school of learning.

Our readers are not unfamiliar with the work of Professor Kuhn's clinic ; several very instructive annual reports and a number of scientific articles from his clinic have appeared in these ARCHIVES, by his assistants, Dr. Manasse and others. He distinguished himself by thorough investigations on the inner ear of different species of animals, and was the author of the exhaustive article on the "Comparative Anatomy of the Auditory Organ of Avertebrates and Vertebrates," in Schwartz's *Handbuch der Ohrenheilkunde*. His excellent clinical and anatomo-pathological papers on Cholesteatoma are well known, and his article on "Neoplasms of the Ear" in Schwartz's *Handbuch* is appreciated.

Though an eminent and enthusiastic specialist, he did not neglect his rather extended general practice, and taught his special pupils not to lose touch with general medicine, and preferred as assistants such as were not likely to fall into narrow specialism.

H. K.

(From a necrology by his pupil, Prof. O. KÖRNER.)

BOOK NOTICES.

X. Atlas der Anatomie der Stirnhöhle, der vorderen Siebbeinzellen und des Ductus nasofrontalis mit erläuterndem Text und Bemerkungen über die Behandlung der Stirnhöhleenerterung. (Atlas of the Anatomy of the Frontal Sinus, Anterior Ethmoid Cells, and Naso-Frontal Duct, with Text and Remarks on the Treatment of Frontal Empyæmas.) By Dr. ARTHUR HARTMANN, Berlin. Published by J. F. Bergmann, Wiesbaden, 1900. Mk. 16 (\$4).

This atlas consists of twelve plates with twenty-four pictures of frontal and transverse head sections showing the relations of the frontal sinus and especially of its inferior part or outlet. The pictures are heliograph reproductions of specimens from the author's well-known collection. They are beautifully done and show the very high position which technical art in Munich has attained. In the text the important features and peculiarities of the specimens are described according to the author's subdivision into the following varieties :

1. Frontal sinuses without frontal cells and without a naso-frontal canal.
 - a. With simple opening through a round aperture or by a fissure into the middle meatus.
 - b. With an outlet into the nose in presence of an unusually developed bulla ethmoidalis.
2. Frontal sinuses with frontal cells which surround a naso-frontal canal.
 - a. With regular order of cells.
 - b. With irregular order of cells.
3. Hernial development of the frontal sinus.
4. Absence of frontal sinus.

A specimen is added to show the method of operating for frontal empyæma and establishing free communication with the nose.

The subject of treatment is fully discussed. A plea is made for the more extended use of intranasal methods, leaving the external operation always associated with more or less disfigurement for those cases which cannot be cured intranasally. If the communication with the frontal sinus be free, and inflation and irrigation have not relieved the discharge and frontal headache, the sinus should be opened externally. The simple opening of the frontal sinus is made on its anterior surface; the author prefers a horizontal incision along the eyebrow, extending slightly beyond the middle line. If a free communication into the nose cannot be made by this exposure, the frontal cells should be exposed from the orbital surface by making a vertical incision downward from the previous incision to the inner canthal ligament. The anterior ethmoidal cells are thus made accessible. The obliteration of the frontal sinus by the complete removal of the anterior wall in deep frontal sinuses is combined with so much deformity that the author considers it only justifiable in cases where cure cannot otherwise be obtained.

A. K.

XI. Diseases of the Throat, Nose, and Ear. A clinical manual for students and practitioners. By P. McBRIDE, M.D., F.R.C.P. Ed., Surgeon to the Ear and Throat Department of the Royal Infirmary, and Lecturer on Diseases of the Throat and Ear in the University of Edinburgh. Edinburgh and London: Young J. Pentland; Philadelphia: P. Blackiston, Son, & Co., 1900. Printed in Scotland. Price, \$7 net.

The author says in this third edition: "The book has been carefully revised, and in parts rewritten, so that I think it will be found up to date in all essentials." The reviewer takes pleasure in adding that the book is most carefully prepared and unusually well written. The selection and presentation of the subject-matter have been made with due consciousness of the responsibility as to the reader's need and time; in other words, the author has aimed at presenting, in the shortest space and clearest language, everything that the scientifically educated specialist in throat, nose, and ear diseases ought to be familiar with. There are a goodly number of illustrations, all in color, all original, and all good, particularly those on affections of the larynx. An extensive index of subjects and authors (twenty-eight pages) contributes a great deal to the general usefulness of the work as a book of reference.

The typography is superb, yet the price—\$7 for a text-book of

700 pages—seems too high. Paper less heavy and less glazed, and print less leaded, would have made a handier and lighter book, less fatiguing to the overtaxed eyes of the majority of the physicians of the present day. H. K.

MISCELLANEOUS NOTES.

In November, 1900, a **Section on Otology at the New York Academy of Medicine** was inaugurated and organized. A number of members of the Academy, taking special interest in otology, had submitted to the council of the Academy a petition to establish such a section under the same rules as the other sections. The petition was granted, and the section constituted itself by electing the following officers: Dr. JAS. F. MCKERNON, president, and Dr. ROBT. C. MYLES, secretary, and determined that regular meetings should be held on the second Wednesday of each month from October to May inclusive, at 8 P.M., in the Academy building.

The first meeting was held December 12, 1900. It was opened by the president of the Academy, Dr. WM. H. THOMSON, with an address on "The Importance of a Knowledge of Ear Diseases to the General Practitioner," which was followed by a paper on "Non-Operative Cases of Acute Inflammation of the Mastoid Cells," by Dr. Gorham Bacon. After the discussion of the paper the Section went into executive session, in which the preparation and publication of the transactions of the Section were discussed. It was determined that the reports should be prepared by an able stenographer and submitted, type-written, to each speaker before being sent to the publishing committee, the latter to consist of the editor of the journal chosen for the publication, the secretary, and a member of the Section appointed by the President.

The ARCHIVES OF OTOTOLOGY was chosen as the journal in which the transactions should be published.

The **New York Eye and Ear Infirmary** has received a gift of \$75,000 for the construction of a pavilion for its **Ear Department**. The donor is WILLIAM C. SCHERMERHORN, second vice-president of the Infirmary.

INDEX OF AUTHORS AND SUBJECTS.

VOL. XXIX.

- Accessory Cavities, Diseases of the (Killian and Zarnikow), 367; Reports on Diseases of the, 90, 228, 416
- ADAMS, J. L., Hot-Air Treatment of Otitis Media, 63; Thrombosis of Lateral Sinus, 66
- Adenoids, Ætiology of (Bloch), 376
- ALEXANDER, F., Out-Door Patients in Strassburg, 118
- American Otological Society, Report of Meetings of, in 1900, 199
- Anatomy, Reports on, 72, 207, 328, 474
- Auricle, Abscess in Front of, after Otitis Acuta (G. Bacon), 397; Double Recurrent Hemorrhage from (Grossard), 392
- Autophony, Personal Experience of (H. Knapp), 325
- BACON, G., "Manual of Otology," Notice of, 424; Otitic Brain Disease, 205; Pre-Auricular Subperiosteal Otitic Abscess, 397; Sarcoma of Meatus, 61, 66
- BALLENGER and WIPPERN, "Manual of the Eye, Ear, Nose, and Throat," Notice of, 424
- BAR, Trichophytosis of Meatus, 392
- BELLIN, M., Report of Otological Section of Thirteenth International Medical Congress, 383
- BERENS, Tinnitus, 63; Vaccination of Meatus, 63
- BEZOLD, Analysis of Rinne's Test, 374-453; Functional Examination of the Ears, 34; Hearing of Deaf-Mutes, 107
- BLAU, L., "Encyclopædia of Otology," Notice of, 96
- BLOCH, Ætiology of Adenoids, 376
- Bone-Conduction, Shortening of, after Injury to Skull (Wanner), 375
- Book Notices, 96, 208, 424, 488
- Brain, Abscess of Temporal Lobe of (Hansberg), 377; Otitic Abscess of Temporal Lobe of (H. Knapp), 68
- BRUEHL, G., Rinne and Gellé Tests, 24
- BURNETT, C. H., Chronic Aural Vertigo, 201
- BURNETT, S. M., Suppurative Disease of Temporal Bone, 1
- Cholesteatoma, Operation for (C. Zimmermann), 290
- Chrome, Perforation of Nasal Septum in Workers on (Rudloff), 381
- COAKLEY, C. G., "Manual of Diseases of the Nose and Throat," Notice of, 98
- COBB, C. M., Nasal Empyema and Middle-Ear Disease, 126
- Concussion, Deafness from (R. Lewis), 63; Ear Diseases from (A. Duane), 62

- COWEN, Transitory Deafness, 62
- Deaf-Mutes, Circumscribed Sound-Defects in (A. Schwendt), 152; Examination of (G. Kickhefel), 185; Hearing of (F. Bezold), 109; Microscopic Sections from (Siebenmann), 373
- Deaf-Mutism, Reports on, 339, 480
- Deafness, Transitory (Cowen), 62
- DELSTANCHE, Dr. C., Obituary Notice of, 105
- DENCH, Ear Trumpet, 67; Sinus Thrombosis, 203, 471; Tuning-Fork Stand, 67
- DUANE, A., Ear Disease from Concussion, 62
- DUFOR, C. R., Hemorrhage after Removal of Myxo-Fibroma from Ear, 19
- DUNN, J., Bezold's Mastoiditis, 124
- Dust-Figures (Schwendt), 375
- Ear, Diseases of the, in Strassburg Hospital (F. Alexander), 118
- Ear Trumpet (Dench), 67
- Eustachian Tube, Clinical Anatomy of (Randall), 202
- Examination, Functional, of the Ears (F. Bezold), 34
- Examination and Treatment, Reports on, 76, 211, 335, 478
- External Ear, Reports on the, 78, 211, 341, 481
- Facial Paralysis Attributable to Gout (Quinlan), 400; Fugitive (F. M. Wilson), 396
- Fistulæ, Paratympanic (Ruault), 386
- FRIEDENBERG, E., Pneumococcic Perisinuitis, 205
- FRIEDRICH, F. P., Diabetic Mastoiditis, 146
- Frontal Cells, Irregular Development of the (Hartmann), 374
- v. GAESSLER, Aural Complications of Scarlatina, 443
- General Literature, Reports on, 74, 208, 330, 474
- German Otological Congress, Report of Ninth Meeting of (Seligmann), 366
- GRANT, DUNDAS, Otitic Pyæmia, 388
- GROSSARD, Double Recurring Auricular Hemorrhage, 392
- GRUENING, Mastoiditis with Herpes, 64, 71; Perisinuous Abscess, 396; Recovery after Otitic Brain Abscess, 53
- GRUENWALD, "Nasal Suppuration," Notice of, 248
- HAJEK, M., "Pathology and Treatment of the Accessory Cavities," etc., Notice of, 101
- HANSBERG, Abscess of Temporal Lobe, 377, 382
- HARTMANN, A., "Atlas of Anatomy and Treatment of Accessory Cavities," Notice of, 288; Irregular Development of the Frontal Cells, 374
- HEAD and ANDREWS, "Year Book of Nose, Throat, and Ear," Notice of, 97
- Hearing, New Tests for (H. Knapp), 61
- Hearing-Exercises, Methodical (Urbantschitsch), 393
- HEGENER, F. J., Sarcomatous Tumors of Temporal Bone, 462
- HINSHELWOOD, J., "Letter-, Word-, and Mind-Blindness," Notice of, 99
- HYNITZSCH, J., Anatomical Investigations of Hypertrophied Tonsils, 356
- Incudectomy (F. Whiting), 57
- JOACHIM, O., Otitic Lateral-Sinus Disease, 251
- KEIMER, Extradural Otitic Abscess, 379

- KICKHEFEL, G., Hearing of Deaf-Mutes, 185
- KILLIAN and ZARNIKOW, Diseases of the Accessory Cavities, 367
- KIPP, C. J., Ice-Coil in Mastoiditis, 65
- KNAPP, A., Otitis Interna, 399; Thrombosis of Sigmoid Sinus, 70
- KNAPP, H., Abscess of Temporal Lobe, 68; Caries of Mastoid, Restoration of Hearing, 199; Hearing Tests, 61; Otitic Brain Abscess, 46; Personal Experience of Autophony, 325
- KUHN, ABRAHAM, Obituary Notice of, 486
- Labyrinth, Rarefaction of Capsule of (F. Siebenmann), 156; Removal of (R. C. Myles), 57
- LAURENS, Rare Otitic Brain Complications, 388
- LEHR, G., Otitic Brain Affections, 172
- Leptomeningitis Otitica (F. M. Wilson), 60
- LEWIS, R., Deafness from Concussion, 63; Mastoiditis after Syringing of Highmore-Empyema, 398; Stenosis of Meatus, 399
- LUC, H., "Lectures on Middle-Ear Suppurations and those of the Nose and Accessory Cavities," Notice of, 243
- MANASSE, Anchylosis of Stapes, 377
- Mastoid, Caries of, Operation with Restoration of Hearing (H. Knapp), 199; Opening of, in All Acute Empyemas (E. F. Snyder), 427
- Mastoiditis, after Syringing of Highmore-Empyema, 398; Bezold's (Dench), 395; (J. Dunn), 124; (Guye), 386; (Moure), 386; from Diabetes (E. P. Friedrich), 146; (Muck), 280; Ice-Coil in (C. J. Kipp), 65; in Children (Ménière), 387; Recurrent (J. F. McKernon), 387; Unoperated Cases of (Molinié), 387; With Symptoms of Herpes (Gruening), 64, 71
- MAY, C. H., Abscess in Temporo-Sphenoidal Lobe, 69; Otitic Cerebral Abscess, 42
- MCKERNON, J. F., Electrolysis for Tinnitus, 394; Recurrent Mastoiditis, 395
- Meatus, Osteoma of (J. H. Pooley), 54; Sarcoma of (G. Bacon), 61, 66; Stenosis of (Lewis), 399; Trichophytosis of (Bar), 392; Vaccination of (Berens), 63
- MÉNIÈRE, Mastoiditis in Children, 387
- Ménière's Disease (Moll), 392
- Middle Ear, Reports on the, 79, 85, 212, 224, 482
- Miscellaneous Notes, 102, 208, 490
- MOLINIÉ, Unoperated Cases of Mastoiditis, 387
- MOLL, Ménière's Disease, 392
- Monotremata, Ears of the, 373
- MUCK, Color of Living Rhachitic Bone, 284; Diabetic Mastoiditis, 280; Otitic Brain Diseases, 287, 300
- MURRAY, W. R., Facial Paralysis in Acute Otitis Media, 21
- MYLES, R. C., Removal of Labyrinth, 57
- Myxo-Fibroma, Hemorrhage after Removal of, from Ear (C. R. Dufour), 19
- Nervous Apparatus, Reports on, 87, 225, 410
- New York Academy of Medicine, Report of Otological Section, by Dr. J. H. Claiborne, 53
- New York Otological Society, Reports of Meetings of, by Dr. H. A. Alderton, 60, 394
- Nose, Miscellaneous Diseases of, Reports on, 91, 232, 417
- Nose and Naso-Pharynx, Reports on, 87, 226, 412

- Obituary Notices (Dr. C. Delstanche), 105; (Professor Kuhn), 425, 487; (Turnbull), 486
- Osteoplastic Operations (Kuester), 217
- Otitic Brain Disease (G. Bacon), 205; (Hansberg), 382; (H. Knapp), 46; (G. Lehr), 172; (Muck), 287, 300; (Witte), 297; Extradural, 379; Reports on, 83, 218, 407
- Otitic Cerebral Abscess (Gruening), 53; (C. H. May), 42, 69
- Otitic Pyæmia (D. Grant), 388; (Zaalberg), 390; Recovery from (M. Toeplitz), 55
- Otitis Acuta, Facial Paralysis in (W. D. Murray), 21; Necrosis of Mastoid in (Scheibe), 380; Pathology of (Panzer), 385; Reports on, 79, 212, 401, 482
- Otitis Interna (A. Knapp), 399
- Otitis Media and Nasal Empyema (C. M. Cobb), 126
- Otitis Media Chronica, Discussion on Treatment of, 385; Hot-Air Treatment of (J. L. Adams), 63
- Otitis Purulenta Chronica, Reports on, 81, 213, 405, 483
- Otogenous Pyæmia (Weil), 378
- PANZER, Pathology of Acute Otitis Media, 385
- Perisinuous Abscess (Gruening), 396
- Pernicious Anæmia, Ear Diseases in (Schwabach), 272
- Physiology, Reports on, 73, 207, 329, 474
- Pneumococcic Perisinitis (E. Friedenber), 205
- POOLEY, Osteoma of Meatus, 54
- QUINLAN, F. J., Facial Paralysis, Attributed to Gout, 400; Post-Auricular Abscess, 70
- Radical Operation, Hearing before and after the (F. Wagner), 260
- RANDALL, Anatomy of Eustachian Tube, 202
- Reports on the Progress of Otology (A. Hartmann), 72, 207, 328, 401, 474
- Rhachitis, Color of Bone in (Muck), 284
- Rinne and Gellé Tests Compared (G. Bruehl), 24
- Rinne's Test, Analysis of (F. Bezold), 374, 453
- RUAULT, Paratympanic Fistulæ, 386
- RUDLOFF, Perforation of Nasal Septum in Chrome Workers, 381
- Scarlatina, Aural Complications of (F. v. Gaessler), 443
- SCHEIBE, Necrosis of Mastoid in Acute Otitis, 380
- SCHWABACH, Ear Diseases in Pernicious Anæmia, 272
- SCHWENDT, A., Circumscribed Sound-Defects in Deaf-Mutes, 152
- Sclerosis, Surgical Treatment of Aural (Siebenmann), 390
- SIEBENMANN, F., Rarefaction of Labyrinthine Capsule, 156; Surgery of Aural Sclerosis, 390
- Sinus, Ligation of Internal Jugular in Thrombosis of (Viereck), 378; Otitic Disease of Lateral (O. Joachim), 251; Thrombosis of Lateral (J. L. Adams), 66; of Sigmoid (A. Knapp), 70
- Sinus Thrombosis (Dench), 203; (H. Woods), 203
- SNYDACKER, E. F., Opening of Mastoid in All Acute Empyemas, 427
- Soft Palate, Pharynx, and Buccal Cavity, Reports on Diseases of the, 93, 237, 420
- Sound, Inadequacy of Arguments for Helmholtz's Theory of (G. Zimmermann), 343
- STANCULÉANU and BAUP, Aural Infection, 390
- Stapes, Anchylosis of (Manasse), 377
- Symptomatology and Pathology. Reports on, 75, 209, 332, 477

- Temperature, Intermittent High (M. Toeplitz), 394
- Temporal Bone, Sarcomatous Tumors of (J. F. Hegener), 462; Suppurative Disease of (S. M. Burnett), 1
- Tests for Hearing, Plan for Unification of, 383
- THOMSON, ST. CLAIR, "The Cerebro-Spinal Fluid," etc., Notice of, 100
- Thrombosis, Ligation of Jugular in Septic (Dench), 471
- Tinnitus (Berens), 63; Electrolysis for (J. F. McKernon), 394
- TOEPLITZ, Intermittent High Temperature, 394; Otitic Pyæmia Infection, Recovery, 55
- Tonsil, Histology of Pharyngeal (F. Wex), 437
- Tuning-Forks, Stand for (Dench), 67
- TURNBULL, Dr. L., Obituary Notice of, 486
- URBANTSCHITSCH, Methodical Hearing-Exercises, 393
- VIERECK, Ligation of Internal Jugular, 378
- WAGNER, F., The Hearing before and after the Radical Operation, 260
- WANNER, Shortening of Bone-Conduction after Traumatism of Skull, 375
- WEIL, Otogenous Pyæmia, 378
- WEX, F., Histology of Pharyngeal Tonsil, 437
- WHITING, F., Incudectomy, 57
- WILSON, F. M., Fugitive Facial Paralysis, 396; Otitic Leptomeningitis, 60
- WITTE, Otitic Brain Disease, 297
- WOODS, H., Septic Sinus Thrombosis, 203
- ZIMMERMANN, C., Cholesteatoma and its Operation, 290
- ZIMMERMANN, G., Inadequacy of Arguments Supporting Helmholtz's Theory of the Transmission of Sound, 343

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CONTENTS OF VOLUME XXIX., NUMBER 6.

	PAGE
1. Shall the Antrum be Opened in All Acute Empyemas of Mastoid Cells? By E. F. Snyder , B.A., M.D.	427
2. Contributions to the Normal and Pathological Histology of the Pharyngeal Tonsil. By Friedrich Wex , Rostock. Translated by Dr. O. JOACHIM, of New Orleans, La.	437
3. Aural Complications of Scarlet-Fever with 12 Post-Mortem Observations. By Bernhard von Gaessler , Munich. Abridged Translation by Dr. O. JOACHIM, New Orleans, La.	443
4. An Analysis of Rinne's Experiment. By Prof. Bezold , Munich. Translated and Abridged by H. A. ALDERTON, M.D., of Brooklyn	453
5. A Clinical and Histological Contribution to the Sarcomatous Tumors of the Temporal Bone. By Dr. F. J. Hegener . Translated by Dr. O. JOACHIM, of New Orleans	462
6. Report of Three Cases of Ligation of the Internal Jugular for Septic Thrombosis Following Purulent Otitis Media—Recovery. By Edward Bradford Dench , M.D.	471
7. Report on the Progress in Otology for the Second Quarter of the Year 1900. By Dr. A. Hartmann . Translated by Dr. ARNOLD KNAPP	474
8. Obituary Dr. Laurence Turnbull, Philadelphia. Prof. Abraham Kuhn, Strassburg.	486
9. Book Notices X.—Atlas der Anatomie der Stirnhöhle, der vorderen Siebbeinzellen und des Ductus nasofrontalis mit erläuterndem Text und Bemerkungen über die Behandlung der Stirnhöhleneiterung (Atlas of the Anatomy of the Frontal Sinus, Anterior Ethmoid Cells, and Naso-Frontal Duct, with Text and Remarks on the Treatment of Frontal Empyemas). By Dr. Arthur Hartmann, Berlin. XI.—Diseases of the Throat, Nose, and Ear. By P. McBride, M.D., F.R.C.P., Ed.	488
10. Miscellaneous Notes Inauguration of a Section on Otology at the New York Academy of Medicine. Gift to the New York Eye and Ear Infirmary for the construction of a building for the Ear Department.	490
11. Index to Authors and Subjects of Vol. XXIX.	491

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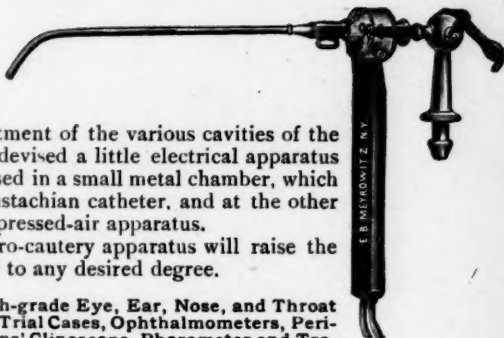
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